

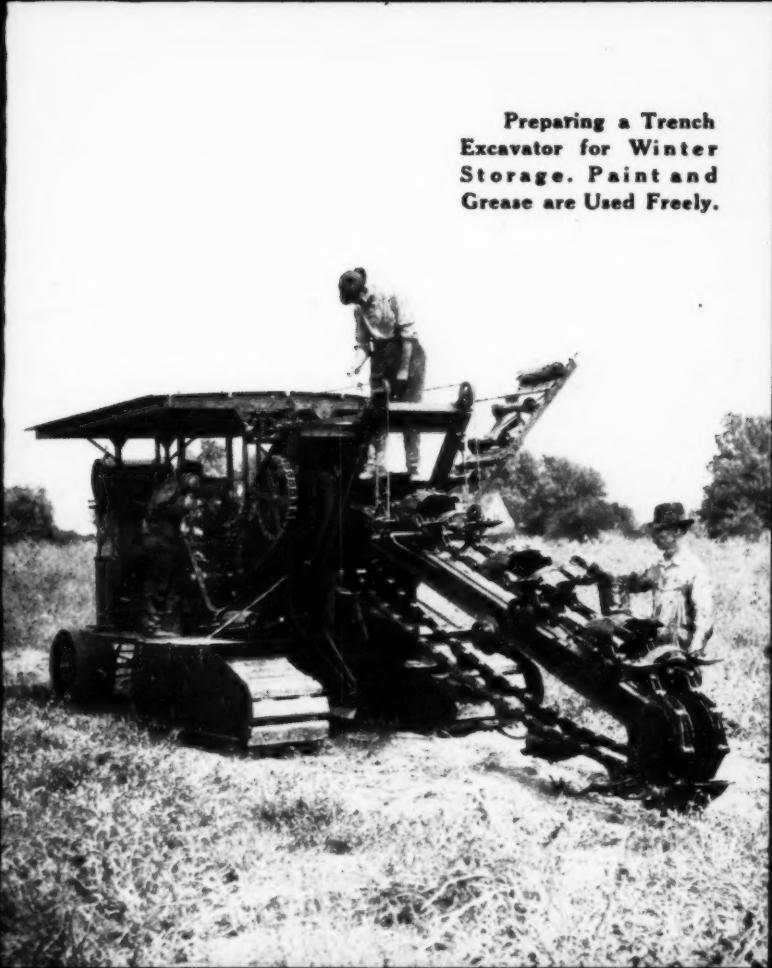
Successful Methods

VOL. 1

OCTOBER 1919

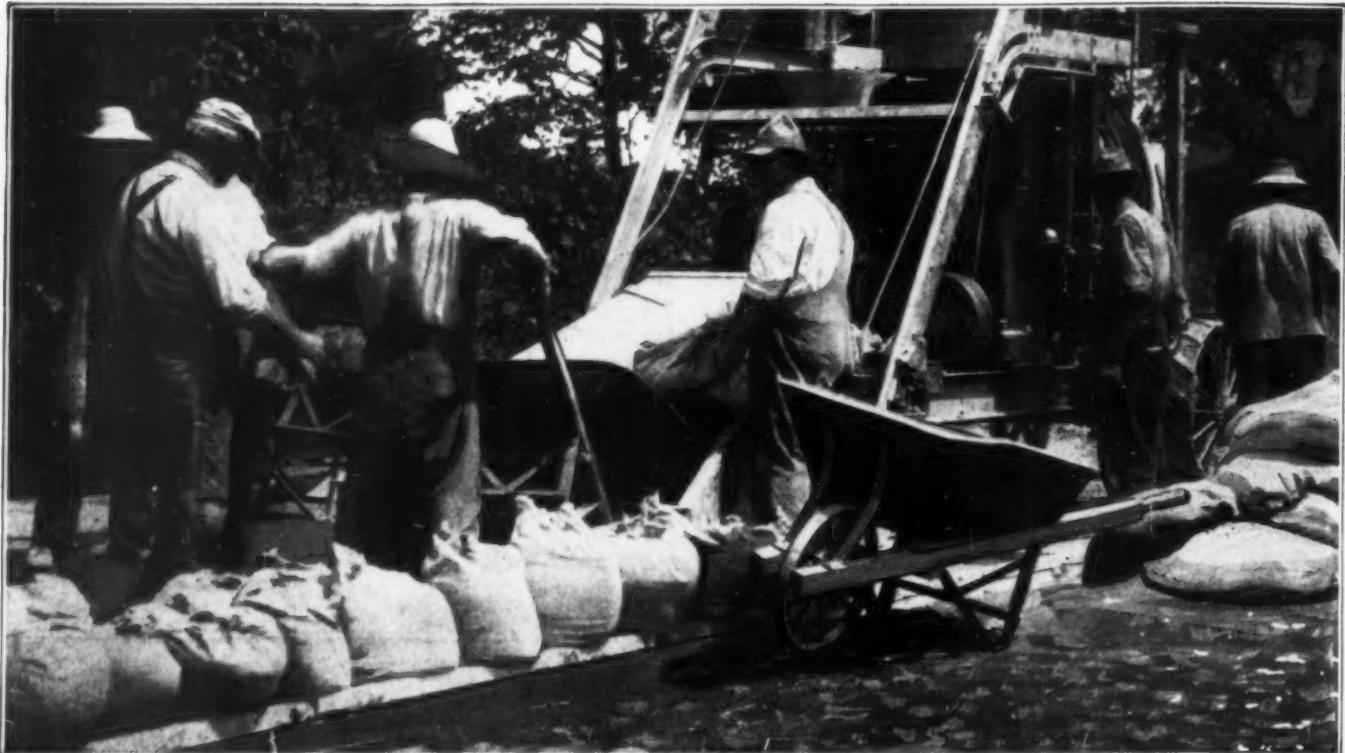
NO. 4

Preparing a Trench
Excavator for Winter
Storage. Paint and
Grease are Used Freely.



In this issue

PREPARING MACHINERY FOR WINTER STORAGE
BORING A TUNNEL WITH AN AUGER
LET YOUR LIGHT SHINE



On the Job With Sterling Wheelbarrows

Never fit the job to the wheelbarrow.

Pick just the wheelbarrow for your particular job from the Sterling Line.

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Successful Methods

A Magazine of Construction Service

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Vol. I

October, 1919

No. 4

[NOT WHAT THEY SEEM

"Contracting appeals to men who are optimistic and to those who have born in them the longing to do things," says Thomas [Bentley of Toledo, "The contractor must be a man first, and must possess that most uncommon thing, common sense. He must have a physical sense that tells a man values without estimating; the sense that tells a man quantities without measuring."

"He must have magnetism in order to gather his men about him, a reputation for justice in order to hold them, and a forcefulness that inspires energy in others. He must have the ingenuity of an inventor and the grasp of a field marshal. He must be a diplomat and a politician, but he must also know when not to be a politician. He must be a financier, a lawyer, a buyer, an advertiser and a prophet."

In spite of these qualifications many men think of a contractor as a sordid individual to be treated with distrust or else as a tool or a machine to be used only to achieve a certain end. Herein is the paradox.

The principle is that manufacturers realize the human element entering into all machine operation. They strive so to perfect their machines, which are made by men, that when they are operated by men they will render the greatest service. Contractors can aid manufacturers materially in this work by pointing out improvements that will make operation easier and more profitable. Manufacturers are eager to improve their machines.

Construction service recognizes the human element in the operation of machines and it will bring about the proper relation between men and their machines. To this end manufacturers send service men into the field. There is an obligation on the part of users of machinery to help them in this work.

This Magazine Will Be Sent to Men Who Can Use It.

This issue has more than 58,000 circulation.

EDITORIALS

The High Cost of Inspection

WHAT is the function of an inspector on the job? The answer from the average inspector probably is: "To see that the specifications as to materials and workmanship are followed."

The answer from the average contractor probably is:

"To show off his college education, to prove to the state, county or city officials that if it were not for him, the contractor would cheat at every turn of the job, to interpret every letter from A to Z in the specifications, and to see to it that the contractor goes broke on the job."

It is a fact that the inspector with his power of "O. K." or "rejection" holds the trump card in what too often is a battle of wits. A little team play between the practical experience of the contractor and the theoretical engineering knowledge of the inspector would many times result in better and more enduring work for the public. But alas! friction, and even open warfare too, often preclude this achievement. This lack of team play sometimes has its conception during the early days of a job when a little patience would solve that problem and lead to a mutual respect for the troubles of the other fellow.

No specifications ever were written that foresaw all the contingencies that constantly arise as the work progresses and the application of the strict letter of the specifications does not always result in the best of work, whereas if the "rule of reason" tempers the decisions of the inspector, the contractor may be spared much annoyance and expense and the public get better work.

Perhaps the answer to this problem is to employ a better grade of men as inspectors. But some will say, "This costs money." Yes, it will—but only a small fraction of what the present system costs.

What has been your experience with inspectors? SUCCESSFUL METHODS would like to hear from you.

Announcement

THE editors are pleased to announce a series of articles discussing various practical methods of increasing the efficiency of machinery operation, by Daniel J. Hauer of Baltimore, Md.

Mr. Hauer is a well-known authority on construction methods and he has made many valuable and interesting investigations for contracting firms.

Contractors' Clients

BROADLY speaking, contractors' clients formerly were corporations and public works officials. Today every person who reads is a prospective client. A contractor's chances to make money and to accomplish work successfully are slim unless his name is known to most of the people who see his work. Therefore, advertising in newspapers and magazines is essential to his progress.

Persons who read the newspapers and magazines are not confined to any one class. They comprise the general public and it is to them the contractor must appeal if he would get his share of the business of his community.

The returns from consistent advertising are two-fold. First, good-will is created, and the disposition to award a contract to a man who is willing to make his qualifications known at some expense to himself is fostered. Second, it is easier for him to get labor. A workman is always attracted to a firm that is well-known.

Practical and effective advertising is not complicated. It is easily read and is set up in an attractive style that will appeal to the greatest number of people who are interested. Effective results are far-reaching, profitable, and not difficult to attain.

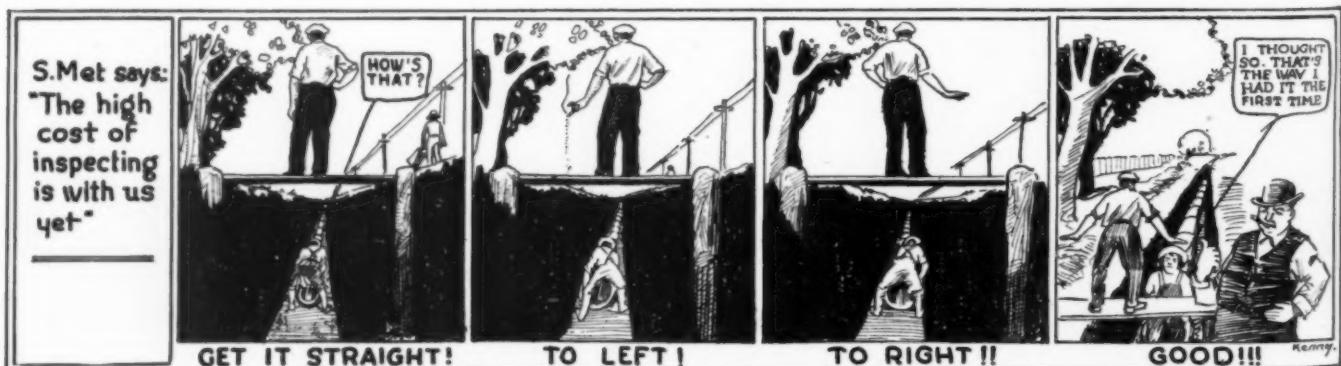
Complete Plants for Foreign Construction

MANY American engineers and contractors do not realize fully the immense strides that have been made in the last few years in plant development.

War conditions made it necessary to assemble complete plants for doing all kinds of work and obtaining maximum production. Many old and heretofore sacred precedents were thrown overboard but no one missed them and better results were secured. And in the development of American export trade many of the new ideas tried out under war conditions are being substituted.

Chief among these is the fact that for maximum production labor-saving machinery always should be used, but not less important is the fact that machinery must be estimated and designed not in terms of single machines, but all the machines together—the unit plant.

Plants of this type have been developed for foreign work and these same plants will have no small value in speeding up domestic production.

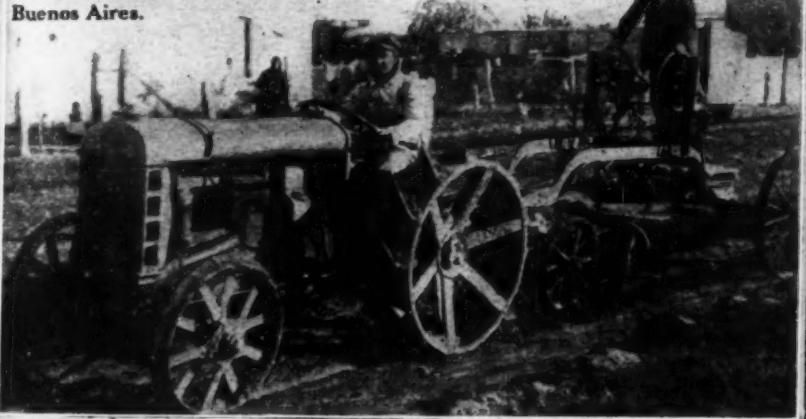


IN FOREIGN FIELDS

Quarrying in France.



At work near the terminus of the Western Railroad 600 kilometers from Buenos Aires.

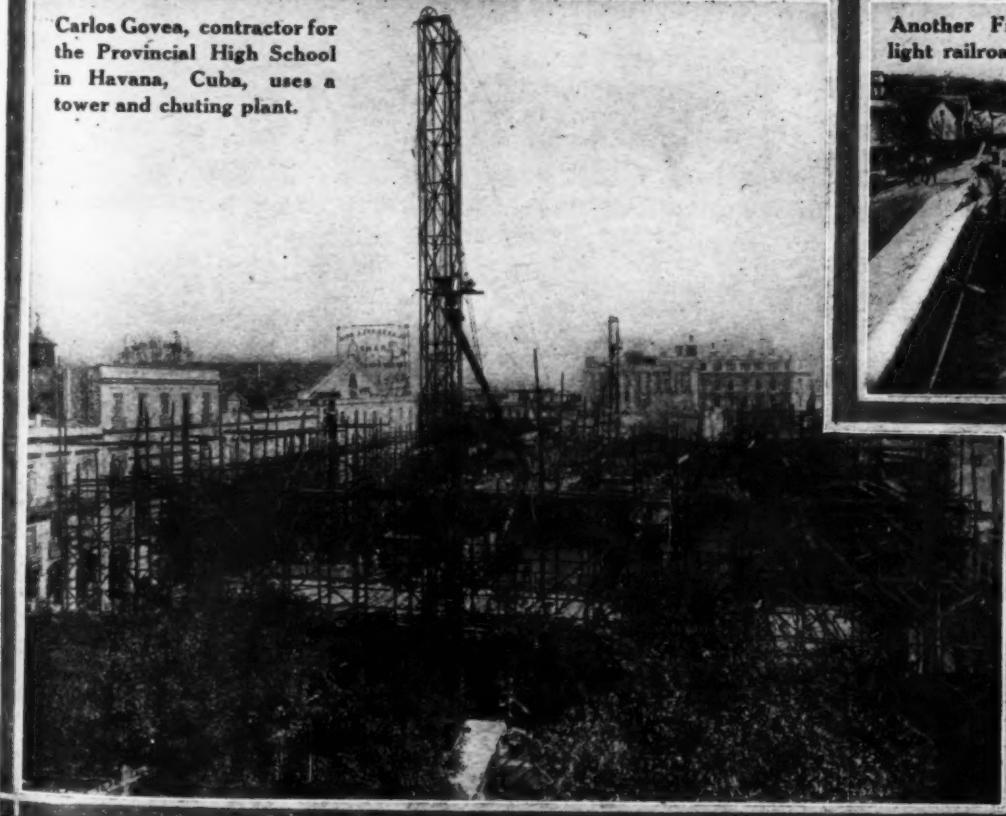


A Blast on the Pampa in the Chilean Nitrate Fields.

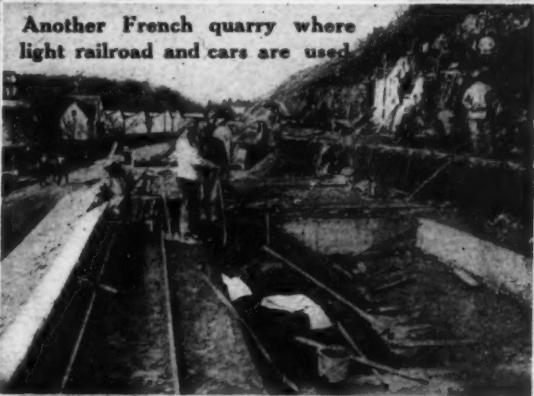
It takes a week to drill an 8 in. hole 10 ft. deep through the hard costra and the caliche into the coba formation.



Carlos Govea, contractor for the Provincial High School in Havana, Cuba, uses a tower and chuting plant.



Another French quarry where light railroad and cars are used.

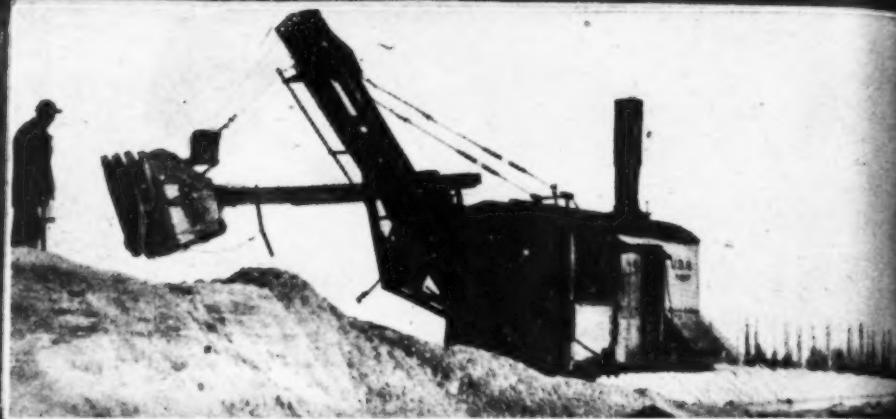


MEN, METHODS

On the right—A steam shovel in military service eating its way into a hillside.

Below—Concrete work in progress on new dam near San Diego, Cal. This dam replaces dam washed out in 1916 with large loss of property and a number of lives. The battery of derricks is performing efficient service.

(Copyright, Western Newspaper Union)



Above—Curved ditch dug by excavator in city street

At the left—Thomas A. Edison chiseling his name on cornerstone of new Ford Plant at Green Island. John Burroughs displays his preference for nature by wandering off where he can look at the River.

(Copyright, Underwood & Underwood)

AND MACHINES



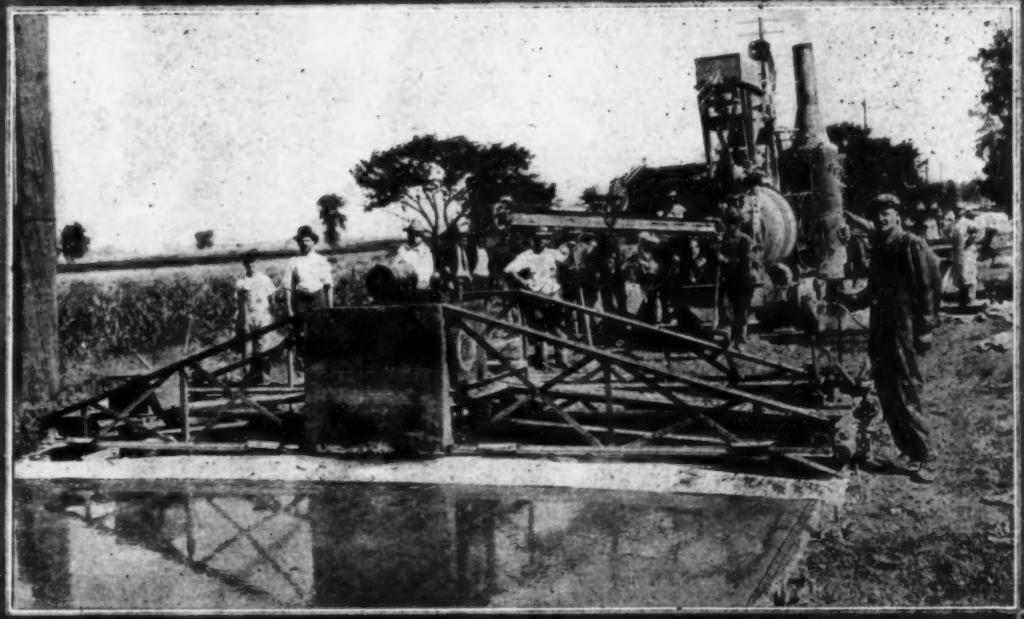
At the left—Machinery transforms road near Elgin, Ill., into track for big auto race.

Below—Another track for automobiles, though not a race track this time. Plank runway over sidewalk on Michigan Avenue corner in Chicago, used while pavement was being reconstructed.



Above — Roadmaking in Virginia — The foreman rides a horse and the shovels are all of African descent.

(Copyright, Underwood & Underwood)



At the right—Putting the finishing touches on a concrete road. The tamping machine in operation.

ROAD BUILDERS



Thos. H. MacDonald

Thomas H. MacDonald, engineer in immediate charge of works under the Federal aid road act and Director of the Bureau of Public Roads, acquired his education and most of his experience in Iowa. He is a graduate of the Iowa State College and after a term of railroad work went back to the College as a professor of civil engineering. In 1906 he was made highway engineer with Iowa's first highway commission and held that position until 1913, when he became chief engineer of the present commission, the place which he left to go to Washington last spring.



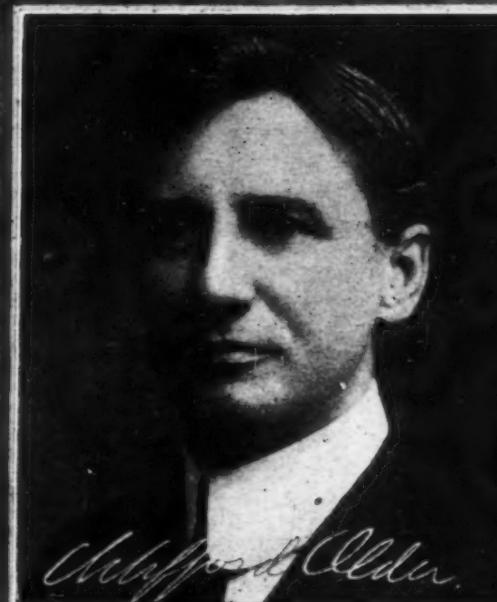

C. M. Babcock

C. M. Babcock, Commissioner of Highways in Minnesota, was born in Sherburne County, August 10, 1871, and has lived there practically all his life. He entered the University of Minnesota in 1892 and since leaving college has been engaged in general mercantile business and banking. Has always been an enthusiastic advocate of good roads and was appointed by Governor A. O. Eberhart as member of the Highway Commission, November 9, 1916, and served in the capacity of chairman. He was appointed Commissioner of Highways April 7, 1917.



John H. Mullen

John H. Mullen, Deputy Commissioner and Chief Engineer of Minnesota, has been associated with the State Highway Department for the last ten years, first as engineer on construction and special work for George W. Cooley, State Engineer for the Highway Commission. In 1910 was made assistant engineer on road work. Upon enactment of the Dunn Road Law, which greatly widened the scope of the Highway Department, was made Deputy State Engineer of Roads, holding that position until April, 1917, when he was appointed to his present position.



Clifford Olden

Clifford Olden, Chief Engineer of the State of Illinois, was born in Adams County, Wisconsin, in 1876; graduated from the University of Wisconsin in 1900. In 1901 he was employed as inspector by the Pennsylvania Lines; in 1902 as assistant engineer on tunnel work by the Wabash Pittsburgh Terminal R. R. near Pittsburgh and as assistant engineer of the C. & A. Ry., having charge of maintenance and construction work; in 1906 as bridge engineer with the Illinois Highway Department and since that date with the highway department of the State of Illinois.



PREPARING MACHINERY for WINTER STORAGE

"THE banister of life is full of slivers," a valued contributor to the *Earth Mover* rises to remark, "and the contractor slideth down thereon with great rapidity. A little thoughtful care of the plant when it is put away after the job will materially reduce the number of slivers picked up by said contractor."

There are two reasons why the average contractor is apt to use less good common sense when he stores his plant than he does in any other branch of his business. The contractor may have lost money on the job and his one idea is to get every man off the payroll at the earliest possible moment. So the shovel is backed off the right of way at the nearest flat spot, dinkeys and cars are piled up alongside the railroad or maybe a couple of miles away, a few boards nailed on and "Finis" written on the job.

Or possibly Mr. Contractor has made money and feels pretty good over it. And he calls in the walking boss and says, "Mike, I've got a lot of unfinished business in town, you store the plant, and see that you do a good job, Mike." With that he beats it for what used to be called the Great White Way, and pays 80 ct. each for "stingers" and spends a lot of time wondering whether the girls are wearing their skirts shorter or whether they are building the sidewalks lower. In the meantime, Mike gets an offer of another job and he says: "Whatell! I can prove an alibi." So he reports in O. K., gets his check and "balls the jack!"

Act 2, Scene 1. One year elapses!

Mr. Contractor decides he wants to sell his plant. He gets all "gussied" up and highly perfumed to show that he doesn't really need the money and some bright morning eases into the office of Mr. Equipment Man, hereafter known as Mr. E. M. At that particular moment Mr. E. M. is foaming into the mouthpiece of the telephone while he tries to convince a lady clerk that he can't build roads without material.

However, Mr. Contractor is greeted effusively with official greeting No. 33, which is used when it's uncertain whether a man wants to buy or sell, and consists of the double hand-shake, right hands firmly grasped, left hand

of E. M. placed two inches below right elbow of Mr. Contractor, followed by a cigar from the lower left-hand desk drawer, together with inquiry as to health, compliments as to appearance and latest stories about the Scotchman in the trenches, whose kilts, etc. Then they both stall and finally Mr. Contractor allows that if properly urged he might sell his plant, but there is no use in offering a low price for he knows to a certainty what a fine plant it is and, of course, it's absolutely complete and ready to go to work tomorrow, because didn't it work right up to the day he stored it and didn't he move 40,000 yd. the last month, etc., etc., etc., same stereotyped bunk that the old chap handed out who did the grading on the Appian Way.

Well, Mr. E. M. yawns, says he never remembers a season when so much good plant was being offered so cheap, but being as how they are old friends, etc., etc., and so he gives his "man Friday" a mileage book and tells him to look this plant over and not eat much on the trains and hurry back. All of which Friday does, except not eat—and when he gets back he brings a report that's a work of art. From a distance it looks like your wife's Christmas bill at the department store, and it shows that about everything that could be stolen or broken has been stolen or broken and that a lot of repairs are needed and generally winds up "I estimate it will cost \$1,500 to load this plant and it looks like hell and unless you can buy it at about a scrap price, you'd better leave it alone."

So Mr. E. M. sends out an S. O. S. for Mr. Contractor and says, "Say, what the merry ding-dong are you trying to get away with? How do you get that way? Look at this inspection report, by an expert, too, never knew him to be mistaken. Thought you had a plant. See what he says about the shovel? 'It wouldn't scramble eggs.' Look what's missing. How about these dinkeys?" etc., etc., etc. And up in the air goes Mr. Contractor to an elevation of about 7,000 ft., does a nose spin, a loop the loop and a flip-flap and when he lands hands out such a bunch of language that everybody in the office has to

grab for his gas mask, all except the stenog, and she shuts off the power on the Underwood and beats it for the hall until the smoke clears up.

The odd part of it is they are both telling the truth, for the plant was in pretty good shape when the old reliable Mike put it away. And good man Friday's report is just about the way it is today. What is the answer to all this? There is only one and that is, "put the plant away as it should be and it means money in your pocket."

Cast your eyes into the future when picking out a location for storing your plant. Select a place that permits the free run-off of rain and melting snow and that the wind will keep swept clear of snowdrifts. It costs something to run a steam shovel out of its pocket in the pit on to clear high ground, but it costs more to let it stand under winter drifts and in a spring pond.

Place your plant so dinkeys and cars can be picked up by a wrecker if you are finishing a railroad job. If the indications are that a wrecker won't be available, store where water is handy and place the cars so they can be reached and loaded with the shovel. The dinkeys should be on one track so that one incline can be used to load all of them.

Wash out your boilers while you have a water line and pressure and after a thorough washing out fill them full of water, leaving just room for 5 gal. of black oil, then draw the water off slowly. Wash-out plugs should be oiled before they are put back and blow-off valves left open. The flues should be cleaned thoroughly, the grates dumped and all ashes cleaned out of the firebox, and then the flue shut and firebox given a coat of heavy black oil, put on with a brush. Open all the flanges in the steam piping so as to insure thorough drainage; the flange packing will be lost, but almost invariably new packing must be put in every spring anyway so the loss is not worth considering.

The smokebox should be thoroughly cleaned, particularly around the bottom of the front flue sheet. The stack should have a cover, preferably a board with a bolt running down through the sack to a cleat to hold it. If you follow the time-honored custom of putting a board over the stack, with a stone on it, some kid will be up there inside of a week, looking down the stack just because he is a kid, and he won't put the board back or the stone, either.

Drain the dinkey and shovel tanks and take the drain cock out of the equalizer pipe on the dinkeys and, as for the fittings! Take them off—for Love of Heaven, take

them off—everything that looks like brass—and box them, carefully, with plenty of waste—mark the box with the manufacturer's name and the shop number of the dinkey or shovel. (Don't mark it No. 7 or Sister Ann or Uncle Zez or some other name that you had affectionately stenciled on the side of the cab on the hectic day that you ordered them)—and after you have done this, put them in your safe deposit box; go see the minister and tell him you will pay a year's pew rent if he will let you store them in the church cellar; give them to your mother-in-law and tell her they are not to be opened until Christmas. Do anything with them as long as you know they will be left alone—and as long as you don't leave them with the plant.

In the case of the dinkeys, steam chest covers should be taken off and valves oiled, cylinder heads taken off, cylinders oiled and the heads shoved as far as they will go. If main rods are left on they should be wired up to the yoke, tight, so that the main pin will clear the back end of the rods. If they are taken off they should be put on the run boards, cleated down and covered with boards. All bright parts should be white leaded, thick. The cab should be thoroughly boarded up with no glass showing. Just remember that most of our greatest pitchers got

their early training from pegging rocks through windows, and dinkey windows are no exception to the rule. In boarding up the cab, fit a door on the back and put a lock on it. If you don't, the first man that comes along to inspect it will pry off half the boards and no one ever knew an inspector to put any of them back.

Wheelbarrows are worth caring for and some contractors are getting on to a mighty good way of repairing them. The old method of repairing wheelbarrows was to look them over and endeavor to locate only the broken parts. Such parts were then ordered and the repairs made. If the wheelbarrow handle was broken, the repair man would chop out this one handle and install a new one. This was a slow and expensive job and it would take a man all winter to repair a few wheelbarrows. The proper way is for the contractor to take every broken wheelbarrow apart, to throw away all of the poor parts, pile his good trays, good wheels, good legs, etc., in their respective piles, and then start in to reassemble his wheelbarrows. The result is that the good parts will just about match up and that out of possibly a lot of 200 or 300 crippled wheelbarrows there will be in the neighborhood of 100 good ones. Then it is necessary to order only enough repair parts to make up the odd good parts re-



READY TO HIBERNATE.

maining. Both steel and wooden wheelbarrows should be painted.

House small machines like concrete mixers, trench excavators, pumps and hoists when laying them up for the winter. This does not mean necessarily that the machine must be put into a storehouse, but that it should be enclosed by some form of weatherproof housing or covering. One contractor in Chicago who owns 3 trench excavators has a concrete house, with a concrete floor, in which he locks his machines. Another runs his machine up on timbers and boards it in tightly, all except the ladder, which is lowered and left sticking out. A third has a large tarpaulin with which he covers the whole machine. These practices exemplify three possible methods of housing, in the order of their excellence. The least excellent is the tarpaulin cover. It should not be employed if one of the other methods is practicable.

Trench excavators are small machines only in a comparative sense, for they are expensive machines and so warrant care in preparing them for storage. Special care should be devoted to the power plant. Where a gas engine is used, remove carbon from piston heads and put in a liberal supply of heavy cylinder oil. Turn motor over several times by hand in order to work oil down between rings and along cylinder walls. Open all pet cocks and water plugs from cylinders, piping, pump and radiator tank to assure the draining of all water. If exhaust pipe is exposed place cover over end of same to keep dust and water from entering motor, which it is well to cover with canvas. All sprockets, chain and gears employed in transmitting power from one shaft to another, and all parts of shafting exposed should be well coated with grease. Chains, sprockets and shaft used on caterpillars likewise should be cleaned and greased. Excavator chain and buckets, after being cleaned, should be protected with a coat of paint. Every part of the machine should either be painted or covered with a coat of grease. Prop the curtains on the sides and ends. Lower the boom until it rests on a wood block or on some means of support relieving strain on the cable. Cables should be covered thoroughly with grease. Remove belts, clean them well and when perfectly dry, box and keep them in a dry place.

Hoists should have the grease cleaned from all painted parts and be repainted; slush the shafting, winch heads and all bright parts with heavy oil; drain the cylinders and leave the cylinder cocks open. Empty the boilers; it is well to run a light fire for a few minutes to dry the head and tubes. Swab the inside of tubes with a heavy

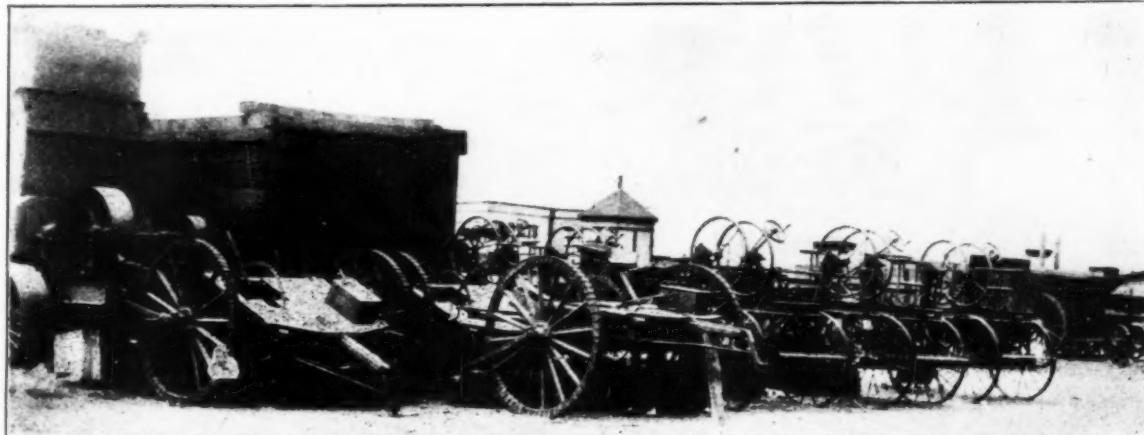
oil. Finally, cover the entire machine with tarpaulin. Electric hoists should receive the same general preparation as steam hoists. The motor either should be removed and stored in a well protected place, which is really the only proper way, or, if this cannot be done, it should be covered with heavy tarred canvas.

Scrapers and graders are a class of tool which it is ordinarily assumed needs no preparation for winter. They both require and repay attention. Clean and paint drag and Fresno scrapers. Wheel scrapers should be freshly greased and nuts and bolts tightened up. Paint the whole machine. If the whole machine is not painted, at least cover the bottom of the pan with some rust preventive; ordinary lead and tallow make a good mixture. Take off the tongues; preferably stack them on end; if stored horizontally place support at the middle, or else the timber will sag and take a permanent set. Clean elevating graders and paint them. Oil bearings. Remove rubber belts and store in a clean, dry shelter. Take off and box the brass oil cups to prevent theft.

Shovels should, of course, be treated in the same general way. If you contemplate loading your cars with your shovel, leave your boom up. If not, crib up in front of the shovel with ties far enough outside the shovel track to clear a gondola and high enough so that a car will go under the 12 by 12's. Put the sticks and bucket on these and then lower the boom on them, leave a couple of lengths of track under this, and when you load out you can run a car under and load without steam. See that the shovel is fitted with all the grab irons, steps, ladders, hand brake and run board; that two pieces of air hose are put away inside the shovel; that the couplers are in working condition, and if the draft sills are of wood, see that the back one isn't half burned out.

Cars should have all brasses taken out and boxed, and the car bodies dumped and propped up, first cleaning out all the dirt that may have stuck in the corners. All of the small tools should be boxed, marked, listed and stored. And while you are doing all this and while your men are on the job who are familiar with the different pieces of plant, make out a list of what repair parts are wanted, some are already wanted, you know, and put the list in your "little red book." No contractor ever lost his little red book, for that's where he keeps his telephone numbers. Give the whole outfit a coat of paint. It doesn't cost much, does a lot of good and while I hate to admit it, it has made a monkey out of more than one inspector.

(To Be Continued in the November Issue.)



A BIG MAN IN A BIG JOB

Rollen Joe Windrow, State Highway Engineer of Texas

ROLLEN JOE WINDROW has a big job. He is State Highway Engineer of Texas. And every man, woman and child who went to school in these United States knows that there is plenty of room for roads in Texas.

But in case anyone still harbors any doubts on that subject perhaps a story may help. Once upon a time there was a big Chicago machinery manufacturer who had an agent in El Paso. A wail for help drifted into the Chicago office one day from an owner of one of the machines in Texarkana, and a hurried search in a postal guide revealed the fact that Texarkana is in Texas. That was easy. The big boss dispatched a telegram to the man in El Paso, telling him to run over to Texarkana and fix up the machine. Having done that the big boss prepared to forget about the matter, but was shocked the next day to receive a telegram from the man in El Paso. It read about like this:

"Why don't you send someone from Chicago? Texarkana is closer to Chicago than it is to El Paso."

But to return to Rollen Joe Windrow, state highway engineer. He has to know the ways, habits and customs of the Texas road and he has had plenty of opportunity to acquire his knowledge of them because he is a Texas-grown product himself. He was born and educated there and in 1906 was graduated from the Agricultural and Mechanical College of Texas. Then he deserted Texas for a while, during which he worked in various capacities on engineering jobs in other states. Upon returning to Texas he engaged in railroad work and later spent a year as instructor at Texas A. & M.

In 1913 the Texas legislature passed a law providing for road improvements in McLennan county that overturned most of the existing customs. It created the office of county engineer and gave him complete charge of the county roads, bridges and drains, abolishing at one fell swoop the old overseer system under which private individuals and small localities did their own road work. This law was so revolutionary that it met with the strongest sort of opposition in the rural districts, and when Mr. Windrow was elected the first county engineer, he didn't exactly have everybody with him. That didn't discourage him, however, and under his executive direction the entire county system was overturned, roads were shortened,

water was drained according to engineering principles, the crown of the highway was determined with a level instead of a two-mule scraper, and bridges were designed to fit the opening to be spanned rather than an opening being made to fit a previously manufactured structure.

And then came the movement for a bond issue for permanent highways. A portion of the county voted

\$1,075,000 in bonds, and every cent of this expenditure was under Mr. Windrow's direction, at the lowest percentage of engineering cost that had ever been known in Texas. He planned an efficient maintenance system in addition to his construction work. With the proceeds of the bond issue he constructed 175 miles of permanent highways. He districted the county into sections and maintained a permanent section crew in each section, visiting each section once a week to direct the work of repair and betterment along engineering lines rather than let it be done by the rule o' thumb.

While he was engaged in this work there was a vacancy on the State Board of Water Engineers, the department in charge of the irrigation interests of the state, and having jurisdiction over all the water

resources. Mr. Windrow was selected for this job.

He served the state in this position for only six months when the City of Waco, in the county where he formerly had been county engineer, raised the office of city engineer to the dignity of what might be called a city manager and offered the position to him. He accepted it and held the place until the opportunity for the organization of a big engineering organization opened for him and it was while he was perfecting this organization that he was appointed to his present position of State Highway Engineer.

As State Highway Engineer, Mr. Windrow will have oversight of the expenditure of the millions of dollars from federal, state and county funds which are to be spent on highway work in Texas during the next few years. His word will be final on all allotments, highway designations, plans and specifications, materials and on contract price wherever state funds are to be expended. This will include work in every county in the state and it hardly requires a look at the map or even the story in the earlier part of this article to convince one that Rollen Joe Windrow has the biggest sort of a big job on his capable hands.



ROLLEN JOE WINDROW.

SAVING LABOR SHOVELING

Height of Casting Affects Amount Shoveled—Correct Position Essential



GETTING UNDER THE LOAD.

IN shoveling ordinary earth it takes at least 150 shovelfuls to make a cubic yard. Each shovelful weighs approximately 12 to 15 lbs. From experiments conducted by Daniel J. Hauer, well known efficiency man on earth work, and other men, it was found that the economical load for an average shovel was 21 lbs. Some men would use a larger shovel, some smaller, but this was the average of a great many tests. The size of the load of course varies materially with the material that is being handled. It will readily be seen, therefore, that there is a possibility of increasing a man's output in many types of materials by about 50%. This increase in output comes largely from experience and industry, but much can be done by fitting the shovel to the work.

In loading vehicles a man working in average earth under normal conditions and times, will throw with a D-handle shovel into a vehicle not over 3 ft. high 1.4 cu. yd.; will throw but 1.33 cu. yd into a vehicle 4 ft. high; 1.2 cu. yd. for 4 ft. 6 in.; for 5 ft. about 1.1 cu. yd.; for 5 ft. 6 in. not quite a cubic yard; for a height of 6 ft. but 0.85 cu. yd.

A man trimming a scow, car or stock pile, where the material is not over 3 or 4 ft. high will average 20 shovel loads per minute.

In casting in average earth not exceeding a horizontal distance of 10 ft. a man will average 18 shovel loads per min.

In loading wheelbarrows, dump buckets, dump carts without tail gates or low cars not exceeding a height of 33 in. a man in average earth will average 15 shovel loads.

In loading dump wagons not exceeding 4 ft. 8 in. in height a man will average 13 shovel loads per min. With 6 in. side boards this will be cut down to 11 shovel loads.

In loading the high, rear-end, dump wagons used in New York City, having a height of 5 ft. 6 in., a man averages 9 shovel loads. With 6 in. side boards this is reduced to 7 shovelfuls.

With a high dump cart, as used in Boston, Mass., with side boards and tail gate reaching a height of 7 ft., but 6 shovel loads are averaged per min.

The human element which enters into the shoveling

operation is perhaps the most important of all. A good foreman with a gang of contented men will get more work and larger shovelfuls than if the men are discontented. A little singing helps with a negro crew.

CORRECT POSITION ESSENTIAL IN SHOVELING

It seems unnecessary to teach a man how to shovel. Nevertheless, men frequently can be taught the proper motions of shoveling, and with green laborers and high wages it is well worth while. Few laborers know how to handle their bodies or the shovels so as to make the work easy for themselves. The greater the ease the more rapid will be the work.

Place men at their work according as they are right-hand or left-hand shoveler. The right-hand man casts his load from his right side, while the left-hand man throws from his left.

The correct positions for a left-handed man shoveling are shown in the illustrations. Is is very desirable that men be trained to shovel either left-handed or right-handed.

Standing close up to the material, the back is bent and the shoulders leaned forward, not as in picking up an article from the ground, but so that the man is well balanced upon his feet. The wrist of one arm



CASTING BY TURNING BODY.



PICKING UP THE LOAD.

is laid on the knee in the advanced position and the other knee rests against the end of the shovel. The shovel is thrust into the mass by a movement of the body, the object being to throw the weight of the body into the motion used in thrusting the shovel. When the shovel is full, the knees are straightened without straightening the back much and with the hands in approximately the same position. The load is cast away by turning the body when the height and distance are not great.

BORING A TUNNEL WITH AN AUGER

Machine Methods Accomplish Rapid Work in Detroit, Mich.

MACHINES have been developed for use in boring through earth as a bit goes through wood. These machines are now working on the \$9,000,000 sewerage project under way in Detroit, Mich.

The earth underlying a portion of the City of Detroit is tough and tight blue clay. This material may be peeled with a knife just as an apple is pared. At intervals of about 1,000-ft. shafts 10 by 12 ft. in size are sunk to the depth of the proposed sewer. This depth varies

return on the other. These cars are pushed by men to the foot of the shaft where chains are hooked on and they are hauled to the surface. The muck buckets are lifted by a 20 h. p. hoist using a $\frac{3}{4}$ -in. cable over a 12-in. pulley until clear of the receiving platform, a 5-ft. gauge car is run under them and they are lowered to the car. This car is pushed out on the dumping platform by hand and the buckets are tilted over dump boards into wagons waiting to receive the spoil. The spoil is hauled off and used for filling.

The average progress made by two tunnel machines over a period of 29 days of 8 hr. each was 16 ft. for one machine and 15 ft. for another. These machines were operating in different headings, but muck from them was hauled to the same shaft.

At the end of 8 hr. operation the tunnel machine is stopped and the workmen spend an hour cleaning up and getting ready for the bricklayers. During the night the tunnel cut in the preceding shift is completed by lining with brick or concrete. In building a brick lining 5 bricklayers take care of the work of 2 machines. In making the tunnel lining 5 men lay the invert following one



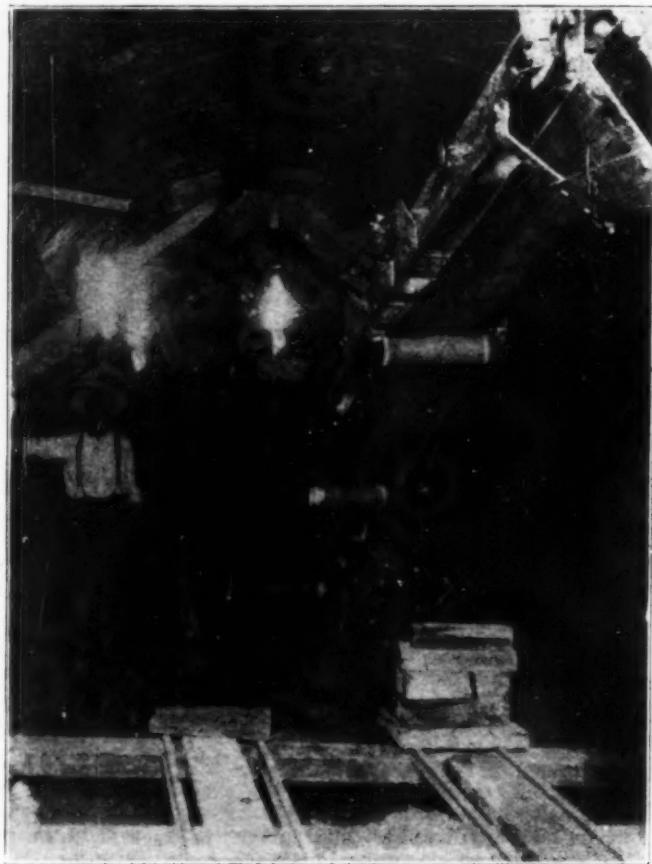
CUTTING HEAD AND MOTOR.

from 20 to 40 ft. The shafts are lined and thoroughly braced. At the foot of these shafts headings are started and enlarged until sufficient space is provided to permit the erection of tunnel machines.

The tunnel machine illustrated consists of a revolving cutting head driven by an electric motor. On the cutting head are knives, backed with springs to make the knives a little more flexible. At the center of the revolving head is a screw conveyor which connects with two continuous belt conveyors. The machine is provided with continuous tread traction.

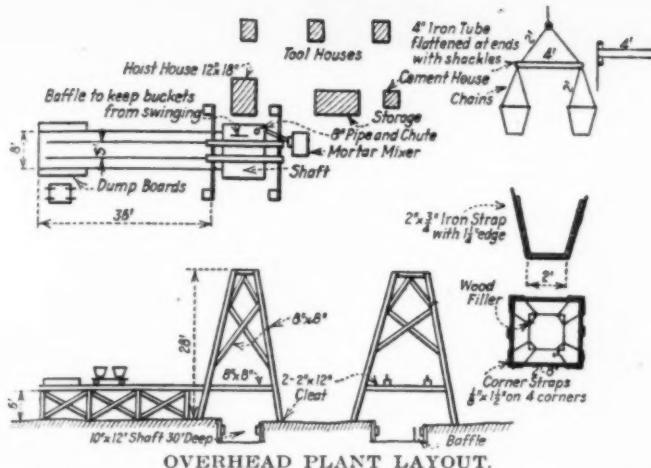
When the machine is in operation the earth is shaved from the face of the heading, guided into the screw conveyor and thence on to the belt conveyors where it falls into muck buckets, as illustrated.

Two lines of 14-in. gauge track are provided, upon which small cars run, each one loaded with 2 muck buckets. Loaded cars leave on one track and the empties



ELEVATING CONVEYOR AND MUCK TRACK.

machine and set the steel templates. When this is done, 3 of the men go to the other end of the tunnel and begin to lay the invert, following the other machine, while the other 2 men finish the arch. Lining, 3 by 3 in. in size is placed as the cylinder is completed. A whole 18-ft. sec-



tion is completed on both sides except for a 2 ft. space at the top. Key boards are inserted in this space, supported by the lagging on either side and the whole key, 18 ft. long, is built at one time. While 2 men are finishing the key the other men go back in the other end of the tunnel and assist in the completion of the arch, following the other machine. Mortar is mixed at the surface in a small concrete mixer and delivered through a 6-in. pipe chute to the bottom of the shaft.

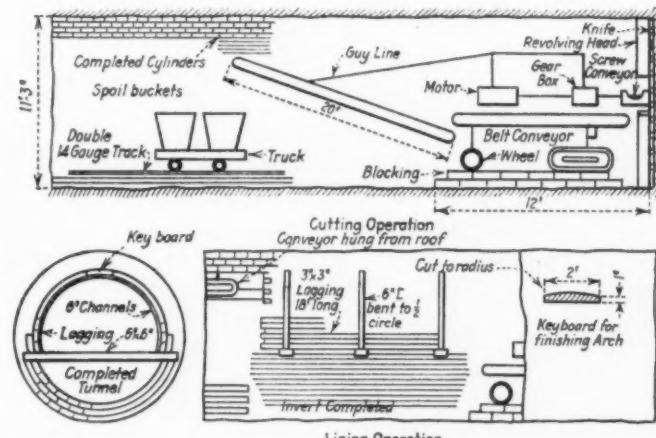
The contractors on the work are Jaynes & Affeld, of Detroit, Mich., with Fred Jaynes as superintendent. John A. Wagner is city inspector, acting for C. W. Hubbell, city engineer of Detroit.

The following force is required to operate the machines, drive the tunnel, and care for the spoil:

NIGHT
5 bricklayers.
14 laborers.
1 foreman.
2 inspectors.
1 hoist man.

DAY
6 tunnelmen.
8 laborers below ground.
8 laborers on top.
2 engineers
1 inspector.
1 foreman.
7 teams.

This force operates 2 machines. Three men are used to operate each machine and teams are used only in the daytime, as the machine does not operate at night.



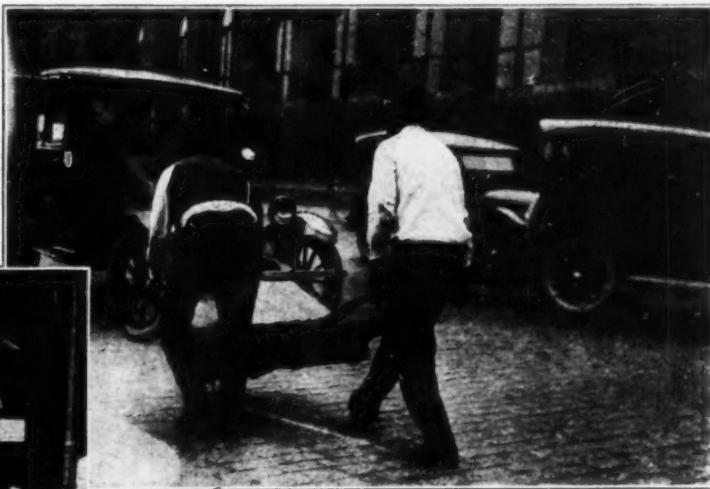
WHY IS A FOREMAN?

How Ingenuity in a Little Thing Saved Money

IN laying pavement intersection on the new Michigan Boulevard link in Chicago, it was necessary to move a large number of heavy curbstones. Traffic at this point is perhaps as congested as it is anywhere in Chicago. Consequently, speed was necessary.

The curbstones, each of which averaged about 500 lb., first were hauled away in small wheelbarrows, as shown in the illustration. Four men lifted the stones on a wheelbarrow and 2 men pushed it.

One of the dirt wagons happened to be standing idle. The foreman did a little quick thinking. He



BEFORE THINKING.



AFTER THINKING.

hitched a chain around two of the curbstones, as shown in the picture, fastened the chain to a wagon and hauled the stones to the nearby storage plant. The men lifting the stones were put at other work.

The question often is asked: "Why is a foreman?" Here is part of the answer—"For quick thinking."

PAYING FOR ILLINOIS ROADS

Bid Prices As Summarized By a Bonding Company

By C. W. OLSON

Special Agent, Conklin, Price & Webb, Chicago.

PRICES for concrete road work since the war have been changing rapidly and some uncertainty exists in the minds of many contractors, engineers and officials as to just what must be paid for concrete roads.

The accompanying tabulation, which was compiled originally for our own guidance in passing on contract bonds, assembles the combined judgment of engineers and contractors to the number shown by the bids column on the right. This table gives the four best lettings of the season in Illinois after the bids become settled somewhat following the figures used in May and June lettings. The September letting of about 55 miles completes the season. Cement is not included in the prices for concrete, this being furnished by the state.

It is understood that 1920 lettings will begin in

January, the plan being to award an unprecedented mileage for construction during the year.

The amount of road work yet to be finished under the \$60,000,000 bond issue in Illinois will be sufficient to interest contractors. Next year it is probable that contracts will be let in larger sections than the work contracted for during the past year.

The "Massachusetts" Highway Contract

THE Massachusetts Highway Commission has evolved a form of contract which has produced excellent results. It belongs to the class probably known as "percentage" contracts, but has several characteristics which differentiate it from the usual contract of that class.

Under its provisions stated prices were fixed for each item of material removed, work done, etc. For example, the contractor was to receive 6 ct. for each cu. yd. of earth excavated; for borrow 6 ct. for each cu. yd. in place; for ledge, 14 ct. for each cu. yd. excavated; for masonry, 50 ct. for each cu. yd. in place; for gravel surfacing, 8 ct. for each cu. yd. in place; for stone filling, 8 ct. for each cu. yd. in place.

These fixed amounts made the contractor's profit depend upon the amount of work accomplished. A set of maximum prices for laborers, teams, etc., were fixed so that the contractor would not be tempted to run the costs up to the sky in his efforts to increase the amount of work alone. This eliminated the dangers incident to the cost-plus system used so much by the Federal Government.

The contractor furnished all tools, foremen, laborers, teams, etc., and was required to build the camps and keep the men supplied. He paid the men and later was reimbursed by the commission after a careful check of his records had been made.

Inasmuch as the price paid to the contractor was based as nearly as possible upon the assumed cost of labor, teams, etc., the more work he could produce for \$1.00 the greater was his percentage of profit and the less the cost to the commission.

This type of contract may be used to advantage in meeting special conditions that arise in contracting work, but its application to large contracts has yet to be tried out and given a thoroughgoing test.

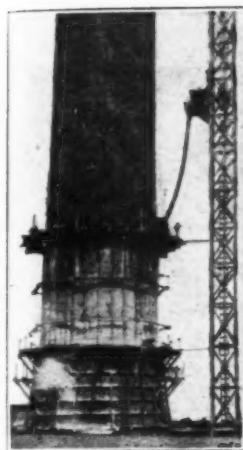
CHARLES WILLARD OLSON Superior Underwriting and Engineering Service Courtney Books, Burpleson, Connelly, Furr, Kelt SUITE 1428 INSURANCE EXCHANGE TELEPHONE WABASH 1220 CHICAGO						
REPRESENTING CONKLIN, PRICE & WEBB CRITCHFIELD, MILLER, WHITNEY & BARBOUR THE INSURANCE FEDERATION OF ILLINOIS						
STATISTICAL ANALYSIS OF ROADWAY UNIT BIDS STATE HIGHWAY DEPARTMENT, SPRINGFIELD. Lettings of July 9, 23, & 30 & Aug. 13, 1919.						
Unit	Quantity	Average	No. of Bids.			
		Bid.	Low	High		
Excav. of earth	Cu. yds.	1,049,158	.85	.50	1.83	139
Borrow of earth	"	118,239	.96	.55	2.00	43
Excav. in rock	"	15,267	3.66	2.50	5.50	6
Earth Shoulders	Sq. yds.	1,284,110	.11	.03	.30	121
Earth Roadway	"	536,982	.08	.02	.15	11
Class A. Concrete	Cu. yds.	11,549	23.56	18.00	40.00	124
Class B. Concrete	"	833	21.85	15.00	40.00	90
Class X. Concrete	"	190	26.25	20.00	30.00	10
Concrete Curb	Lin. ft.	39,480	.70	.40	1.50	25
Concrete Catch Basins	Each	82	56.10	25.00	100.00	28
Brick Masonry	Cu. yds.	45	35.23	22.00	67.50	31
Structural Steel	Lbs.	445,350	.096	.08	.15	11
Reinforcing Steel	Lbs.	1,067,632	.07	.04	.11	91
Port. Cement Concr. Pav.	Sq. yds.	1,619,656	2.09	1.31	3.50	119
Monolith.Brick Pav.(4")	"	303,997	3.97	3.20	5.71	11
Bit. Conc.Pav.(with Binder C.)	"	201,647	2.86	2.83	2.90	10
" " " (without B. C.)	"	201,647	2.67	2.60	2.75	10
Bit.Mac.Pav.(5"Base)	"	6,222	2.77	2.77	2.77	1
" " " (3"surface)	"	12,356	1.86	1.86	1.86	1
Creosote Plank Fl.(bit.Sur.)	"	788	3.37	2.00	4.60	7
Gravel Pavement	"	1,440	1.60	1.50	1.66	5
Surfacing		12,843	.91	.91	.91	1
Clearing and grubbing	Acres	45	315.00	75.00	800.00	5
Pulling Hedge	Lin. ft.	2,105	1.14	.16	3.00	5
Rip Rap	Sq. yds.	176	2.87	1.10	7.00	6
Stone Wells	Each	10	7.66	5.00	10.00	9
Guard Fence	Lin. ft.	8,360	.86	.57	1.75	24
Creosoting Piles	"	1,650	1.76	1.25	3.00	3
Untreated Piles	"	4,770	1.25	.80	2.00	10
Woven Wire Mesh	Sq. ft.	5,340	.065	.03	.10	10
Name Plates	Each	62	25.60	5.00	67.00	56
Route Markers	Each	102	22.04	7.50	75.00	87
Section Markers	Each	118	18.13	7.50	60.00	132
City Limit Markers	Each	20	21.02	15.00	75.00	16
6" Vit.Pipe Underdrain	Lin. ft.	4,311	.61	.40	1.50	19
8" " " "	"	6,190	.91	.48	1.75	10
10" " " "	"	40	1.16	.58	2.04	6
12" " " "	"	150	1.66	1.00	2.50	5
18" " " "	"	50	2.31	1.55	3.25	5
6" Shale Pipe Underdrain	"	2,150	.49	.40	.75	8
8" " " "	"	5,950	.67	.28	1.75	11
10" " " "	"	1,430	.77	.60	1.35	6
12" " " "	"	1,000	.90	.70	1.00	3

TABULATED RESULTS OF BIDS IN ILLINOIS.

STEEL STACK GETS CONCRETE OVERCOAT

**Wooden Tower Said To Be Highest in the World Is
Erected on Roof of Cleveland Building**

By C. W. GARRISON



A FIVE-INCH ring of reinforced concrete was placed around one of the 214-ft. steel stacks on the Cleveland Electric Illuminating Company's power plant by the chute and tower method while the stack was in continuous service, with a resulting saving in time and money.

The great steel stacks, 40 ft. in diameter at the base to 19 ft. at the top, were becoming weakened by rust and the chemical action of smoke. A concrete coating was proposed as a remedy, but a difficult

problem was how to place the concrete. George Wiltsie, superintendent for the Rust Engineering Company, who were the contractors, supplied the answer.

Concrete was mixed at ground level, hoisted in the small tower shown in the foreground in the photograph, and carried by chutes to a receiving hopper at the foot of the high tower. There it was raised to the desired height and placed in the forms by means of an elephant trunk chute.

When ready to pour concrete the chute was swung half-way around the stack to the point farthest from the concrete tower. As the forms were filled one or two of the 3-ft. chute sections were removed so that the mixture could be placed exactly where it was wanted. After one-half of the concrete ring was poured the same operations were repeated on the other side of the stack.

This method necessitated the construction of a tower 256 ft. high—thought to be the highest wooden tower ever built. The height of the top of the tower above the level of Lake Erie was 311 ft. As shown in the pictures the working scaffold was hung from a cat head.

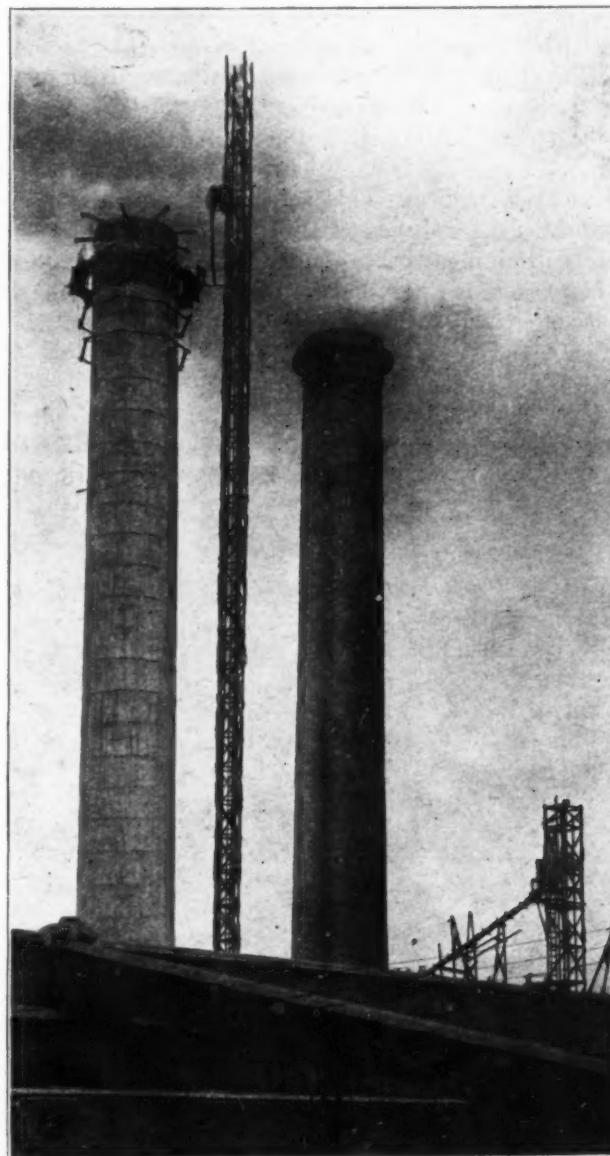
The total volume of concrete used was about 140 cu. yds. At the base of the stack the inside diameter of the concrete ring is 40 ft. and the concrete is 9 in. thick. At 16½ ft. from the base the concrete is 7 in. thick. The steel stack tapers to 32-ft. diameter at 34½ ft. from the base. The concrete is 5 in. thick from this point to the top of the stack. At the top the diameter of the steel stack is 19½ ft. The concrete is heavily reinforced with 5/8-in. rods and wire mesh. Wood forms were used on the first 34½ ft. and steel forms for the remainder of the height. The aggregates were heated before mixing by steam pipes extending through the material piles from the power house. The concrete was protected while setting by a heavy tarpaulin wrapped around the stack.

Work was begun late in December, 1918, and the job was completed by May 1, 1919. The rate of progress on the job depended on the speed with which the forms could be moved. The largest week's work was the pouring of six 7½-ft. sections 5 in. thick. From 9 to 12 men were employed, including hoist operators and the mixing crew.

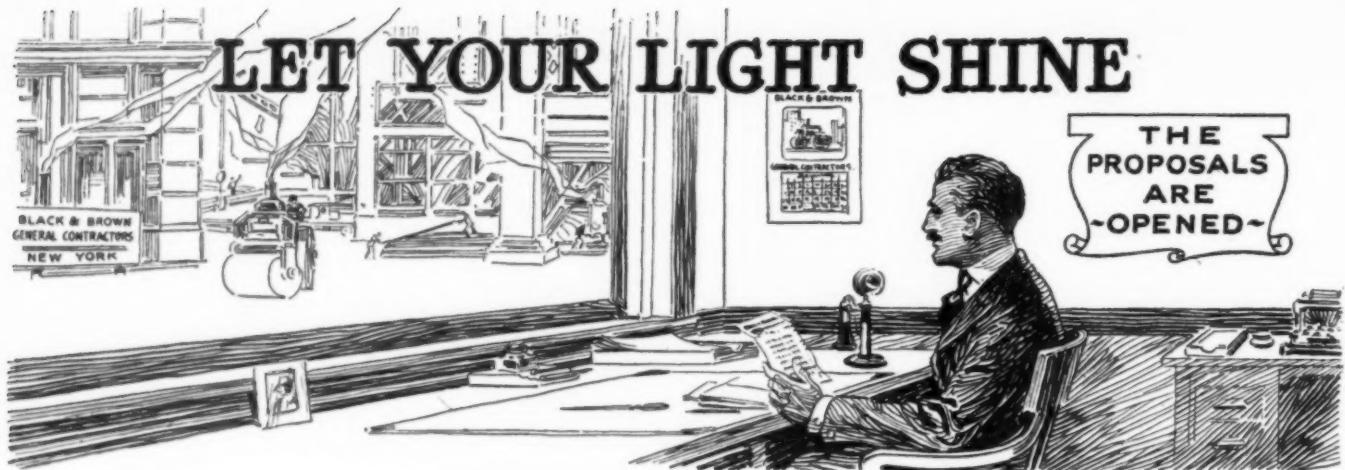
Their work illustrates the flexibility of spouting methods as applied to placing concrete. The rate of speed at which the work progressed through the winter months and the small force required also are interesting.

The application of a concrete overcoat to many decrepit steel stacks scattered throughout the country is one method of meeting the present high cost of steel and improving the efficiency of industrial power plant stacks. When an old stack is overcoated it is unnecessary to provide inside forms and the result attained is a durable concrete stack at a comparatively low cost.

The attention of contractors and industrial plant executives is called to this effective method of reconstructing old steel stacks. Their usefulness can be prolonged for many years.



ALMOST AT THE TOP



Hiding his light under a bushel never helped a contractor to get new business. Because so many contractors are victims of an unnecessary quantity of modesty this article is published. It proves that the contractor has a host of chances to advertise of which he should take advantage to the fullest extent.

A GOODLY number of contractors scattered throughout the country have discovered that advertising pays and have adopted various and sundry methods of apprising the general public that they are contractors, are proud of it, and are ready for any job that said general public may entrust to them. This article will describe briefly a few of the successful advertising methods in use by contractors in different parts of the country. Some of them are old, others are new, but all of them help to bring in the business, and if they do that nothing else counts.

SIGNS ON MOVABLE EQUIPMENT

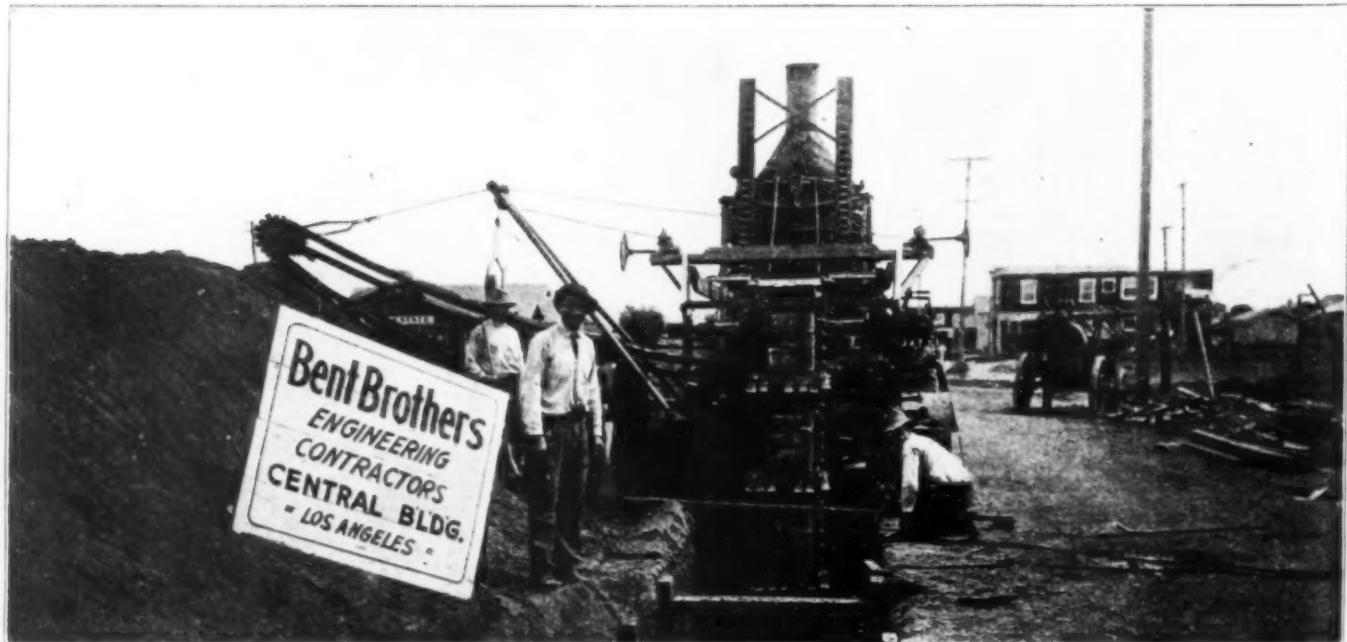
Inasmuch as every contractor has numerous pieces of movable equipment ranging all the way from steam shovels to tool boxes, he has in them an unrivalled oppor-

tunity to paint his name and business upon them and make them help in spreading his fame as well as doing the actual work for which he bought them. A good readable sign painted on a contractor's wagon which perambulates hither and yon in the course of its daily duties is an invaluable advertisement.

"But," someone may say, "Every contractor puts his name on his wagons." Possibly he does, but how often is his name painted on it in such a way that it is almost lost to sight? Or how often does he let his name become so obscured by mud and dirt that its visibility reaches the vanishing point? It is perfectly true that mud and dirt are ever present on the average contracting job, but it is just as true that water also is somewhere around, and the application of a little water generally will suffice to restore the contractor's name to its rightful place in the sun.

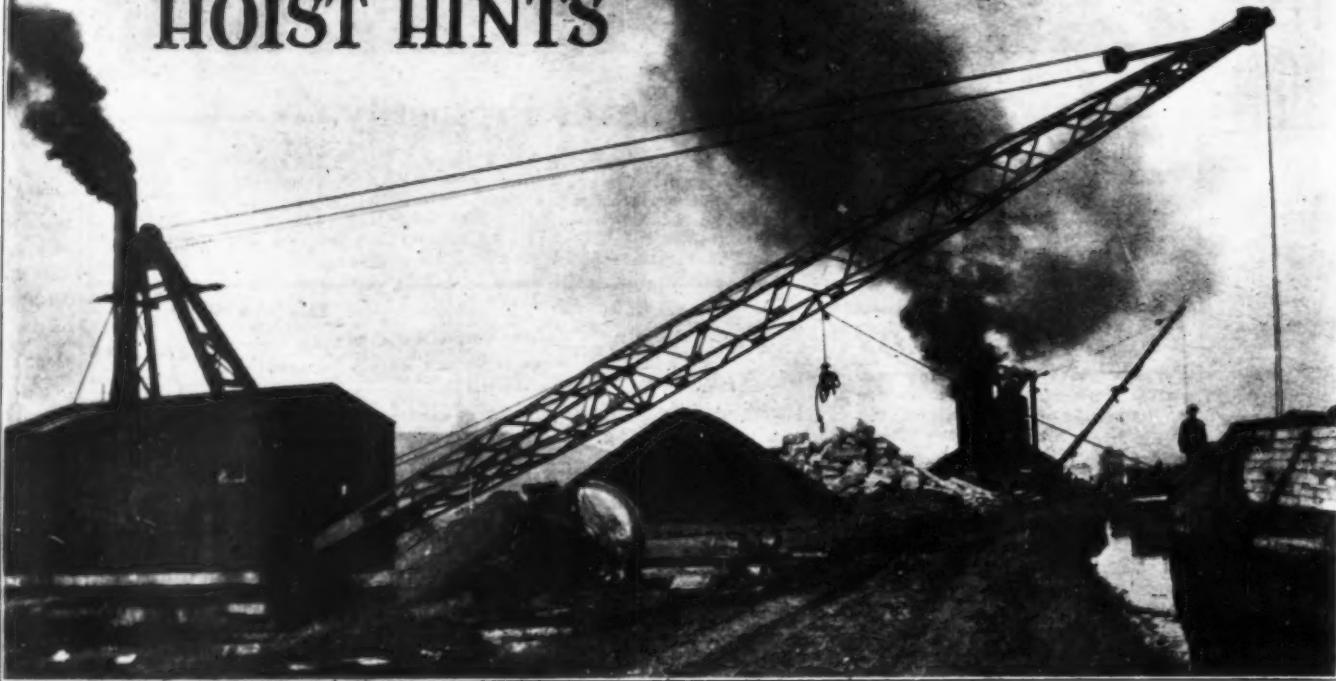
SIGN BOARDS ON THE JOB

So much for the signs affixed to the contractor's movable property. No one can object to their presence but sometimes it is a different story when it comes to sticking up sign boards here and there on the trees and



NO BASHFULNESS HERE.

HOIST HINTS



HOISTS are built to stand hard work and hard usage; but, like all other machines, they need some attention if they are to do the best work of which they are capable. Run them to the limit of their capacity; they are built to stand it, but take decent care of them.

BOILER HINTS

1. Firing up too rapidly when the boiler is full of cold water will result in leaky tubes and seams.
2. Flues should be cleaned once a week or the boiler will not steam properly.
3. Blow-off a gauge and a half of water once a day at 60 lbs. pressure.
4. Clean boiler thoroughly once in two weeks.
5. Bad water can be partly counteracted by the addition of a pint of kerosene when filling. If no kerosene can be procured, a few potatoes will help keep the scale off the tubes.
6. Up-and-down brace rods must not be tightened up when boiler is cold, or expansion on heating will break the rods.
7. To prevent steaming close stack and ash-pit dampers and bank fire with green coals; in this way steam will hold for hours at a time. Don't open the fire box door to prevent steaming; the cold draught will cause leaky flues.
8. Gauge-cocks should be tried for water before steaming up. See also that there is water in the glass.

ENGINE HINTS

1. Cylinder cocks must be opened before starting engine after it has been standing for some time; failure to do this will result in a loose piston or the knocking out of a cylinder head. After the engine is warmed up, close the cocks.
2. Oil the bearings and cylinders regularly; oil is

cheaper than grief, and you are bound to have one or the other.

3. Tighten bolts and nuts as soon as they begin to work loose. Do it with the wrench provided, not with a hammer or cold chisel.
4. Open drain-cocks and drain lubricator before leaving engine at night; otherwise, in cold weather, your engine will be frozen solid when you come back in the morning.

5. Do not alter the valve-gear on a new engine. Before leaving the shops it is set by a valve-expert to give the greatest possible efficiency and no adjustment of any kind is necessary.

DRUM HINTS

1. Tighten spring-bridle nuts to $\frac{1}{8}$ -inch from gear when friction is set; this will allow the drum to revolve freely on the shaft when friction is released. If this is not done, the spring bridle will cut into the drum.
2. Grease-cups on drums are large enough to supply grease for a ten-hour run if screwed down occasionally. Be sure to fill them every day.

CLEANING RAILROAD DITCHES

Teams and scrapers have given good results in railway ditching. Dirt can be handled in this way in very short cuts and across track for 20 to 25 cu. yd. per hour. These figures are based on teams at 80 cu. yd. per hour and labor at 25 cu. yd. Where heavy ditching is to be done the committee recommends the use of steam ditchers, together with at least two 16 to 20 cu. yd. side dump cars and a spreader car for short hauls. For a longer haul from four to six side dump cars and light engine should be used. With an outfit of this kind, which includes a train crew, ditcher engineer and firemen, dirt can be handled for 10 to 25 cu. yd. per yard, depending on the haul.

A Cooperative Export Service for the Benefit of the Buyer

¶ The non-competing manufacturers whose advertising appears in this magazine realize that their export business can not be entrusted to the ordinary export jobber.

¶ They realize that the foreign user of American machinery is entitled to the best of construction service—to the best of warehouse facilities—to the best packing—to the best in shipping—and to the standardization of design and of parts.

¶ The ordinary export jobber who conducts his business over a desk is not in a position to contribute anything to this Construction Service idea.

¶ Neither is it practical for the individual manufacturers to achieve the maximum in this direction.

¶ That is why the export business of this group is handled by the Allied Machinery Company of America. This makes it possible to maintain one corps of Standardization Engineers and one set of warehouse, packing, and shipping experts.

¶ All of this means just one thing—better service to the export buyer.

¶ And incidentally—but of no mean importance—the domestic buyer profits from this group study and standardization of machines, parts, and service.

ALLIED MACHINERY COMPANY OF AMERICA

Cable Address: ALMACOA

51 Chambers Street, NEW YORK

The branch offices, affiliated companies and representatives of the Allied Machinery Company are located at the addresses given below. Stocks of machinery and repairs are carried at most of these points. Sales engineers also are available there. This service is being expanded as rapidly as conditions will permit.

ARGENTINA—Venezuela 691, Buenos Aires.
J. A. Cordeal—Cable Address: ALMACOA.

AUSTRALIA—76 Pitt Street, Sydney.
A. N. Herrick—Cable Address: CONALMAC.

BELGIUM—34 and 36 Rue Melsens, Brussels.
Allied Machinery Co. of America—Cables: ALMACOA.

BRAZIL—90-92 Rua Sao Pedro, Rio de Janeiro.
Oscar Taves & Company—Cable Address: ARAMPO.

BRAZIL—Sao Paulo—Byington & Company.
Cable Address: ALTON.

CEYLON—P. O. Box 193, Colombo, L. R. Vinall-Moon.
Cable Address: ALMACOA.

CHILE—Iquique—Allied Machinery Company of America.
Cable Address: ALMACOA.

CHILE—Calle Bandera 261, Santiago.
Allied Machinery Company of America.
Cables: ALMACOA.

CUBA—Havana—Allied Machinery Company of America,
Obrapia 23. Cable Address: ALMACOA.

ENGLAND—London—18 Birch Lane, Lombard Street,
B. C. Milner. Cable Address: AMINTERCOR.

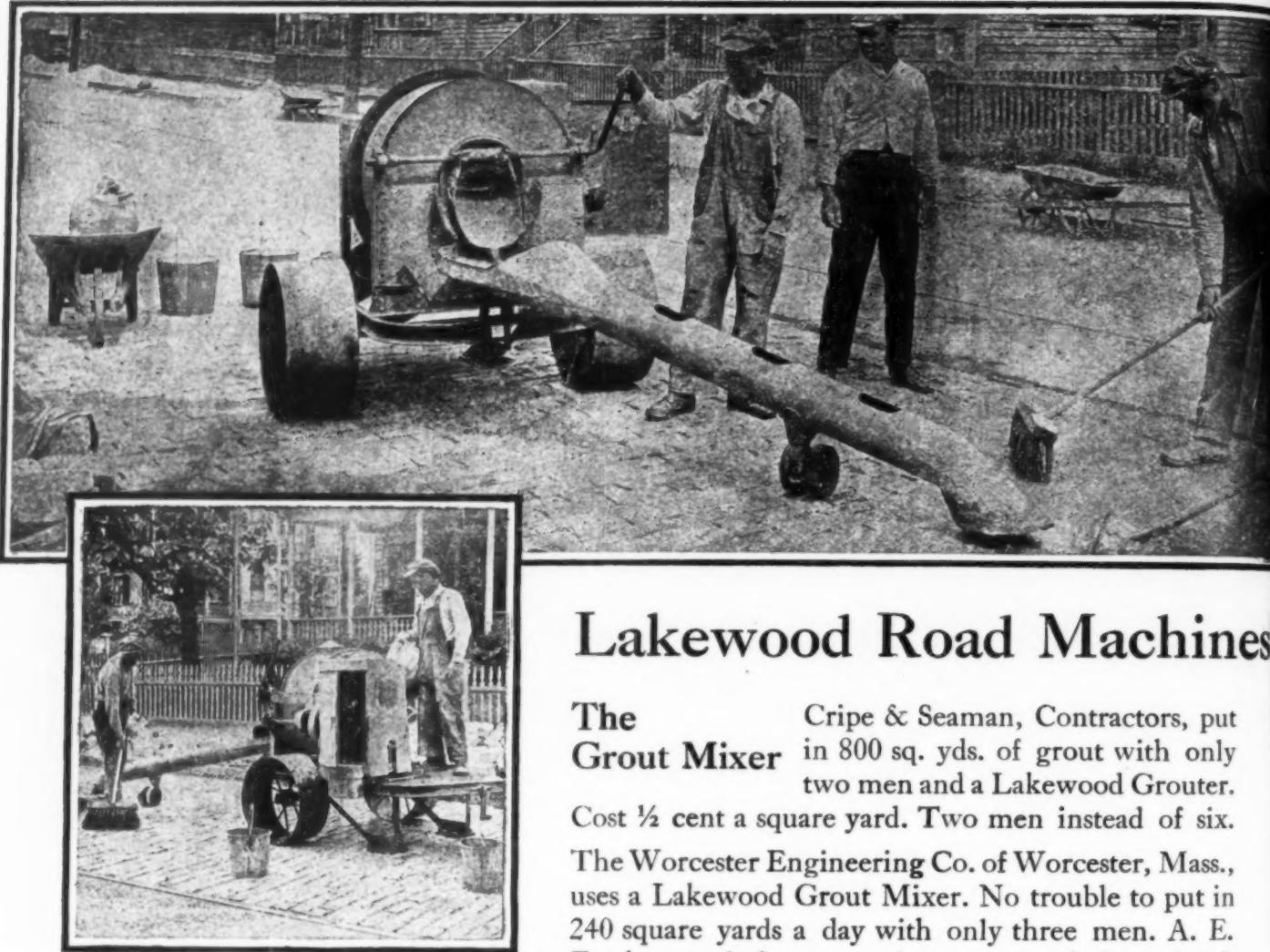
FRANCE—Paris—Allied Machinery Company de France,
19 Rue de Rocroy. Cable Address: ALMACOA.

ITALY—Turin—Allied Machinery Company d'Italia, Via XX
Settembre 12. Cable Address: ALMACOA.

JAPAN—Tokyo—Horne Company, Ltd., 6-7 Takiyama-cho,
Kyobashi-ku. Cable Address: Horne.

PORTUGAL—Rua do Alecrim, 10, Lisbon.
Monterio Gomes, Ltd.

SPAIN—Barcelona—Plaza de Cataluna 8.
C. B. Watrous.



Do You Know About the Lakewood Way?

More than double the usual amount of road can be finished in a season by building the Lakewood Way. Longer working season, fewer men at the mixer, clean subgrades—these are a few of the advantages of using the Lakewood method. Details in Bulletin 29-B—Want a copy?

Lakewood Road Machines Th

The Grout Mixer Cripe & Seaman, Contractors, put in 800 sq. yds. of grout with only two men and a Lakewood Grouter. Cost $\frac{1}{2}$ cent a square yard. Two men instead of six.

The Worcester Engineering Co. of Worcester, Mass., uses a Lakewood Grout Mixer. No trouble to put in 240 square yards a day with only three men. A. E. Freshwater & Sons are using two on their road job near Painesville, O.

These and many other cases, show the economy of using the Lakewood Grout Mixer to save on road and street work. The saving in labor soon pays for the mixer. Details and specifications?—by return mail?

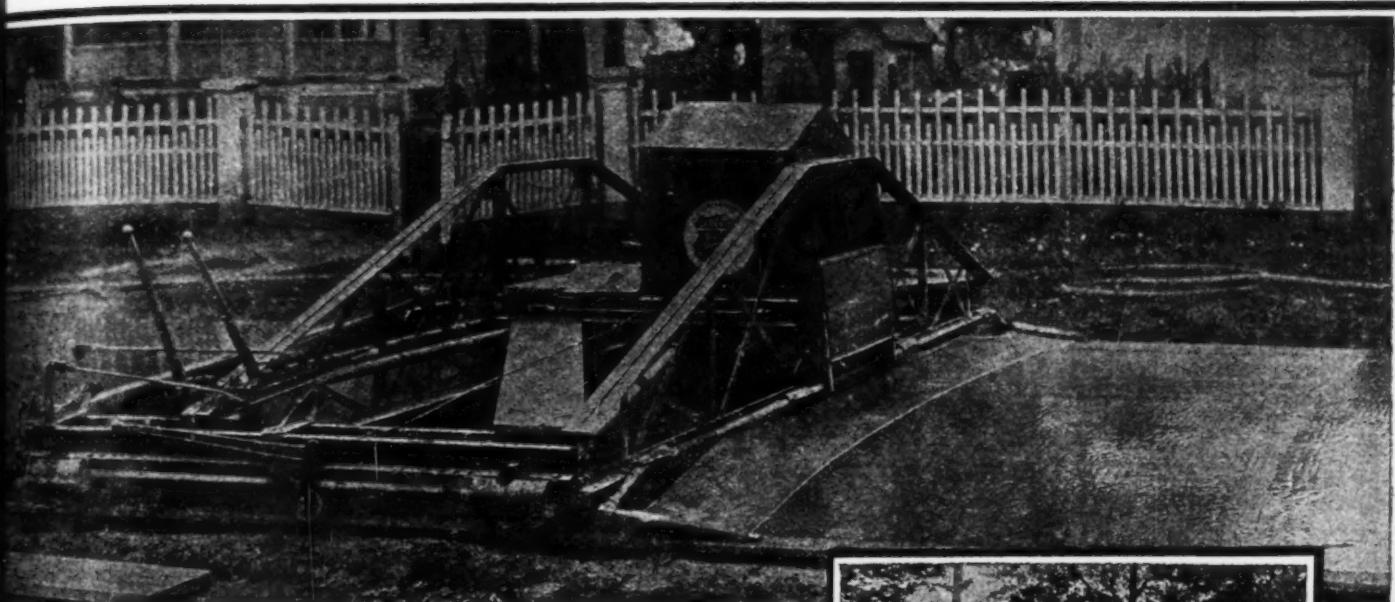
Offices in New York, Boston, Philadelphia, Washington, Pittsburgh, Detroit, Chicago, Milwaukee, Salt Lake City, Los Angeles, Seattle, Kansas City, Oklahoma City, San Francisco and Houston.

Lakewood Road Co



EXPORT DEPARTMENT
ALLIED MACHINERY COMPANY OF AMERICA
51 CHAMBERS ST. NEW YORK USA CABLES ALMACOA NEW YORK





es That Do the Work of Men

With the increasing use of stiff concrete and with specifications calling for a much drier mix than in the past, contractors felt the need for a machine that would handle stiff concrete. To work and finish the concrete by hand was too expensive.

This need was anticipated by Lakewood—the 1919 model Road Finishing Machine was announced early this year. How well the machine fills the need is evidenced by the flood of orders received.

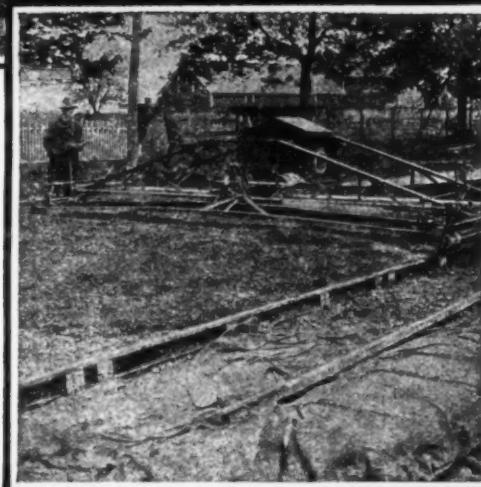
See the Finisher in action. A list of the jobs nearest you where Lakewood Finishers are used will be sent on request.

THE LAKEWOOD ENGINEERING CO.
CLEVELAND, U. S. A.



MANUFACTURERS
DISTRIBUTORS
INCORPORATED

MP



The Finisher Spreads, Compacts and Surfaces

A member called the strike-off spreads the concrete to the necessary crown. The tamping member compacts the concrete and brings the surface to the exact height and crown. A belt at the rear finishes the surface. One man, with the Lakewood Finisher and two men to spade concrete, can do the work of 8 or 9 men.

Construction Plant



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ALLIED MACHINERY COMPANY OF AMERICA
51 CHAMBERS ST. NEW YORK U.S.A. CABLES ALMACOA NEW YORK





One of These Lakewood Mixers

The Lakewood Low Charge
—a heavier mixer built to give long, continuous service with practically no repair. A small edition of the big Lakewood mixers in 4 and 7 cu. ft. sizes. Power loader, batch hopper or platform.

W. L. Eby, Contractor, of Oklahoma City, used his Lakewood Low Charge Mixer 300 days continuously one year and 250 days the next year. The only new parts purchased were two drive chains.

Today the mixer is practically as good as new. Mr. Eby used it to mix concrete on the new Exposition Building for the Oklahoma State Fair this year.

110 of these Lakewood Low Charge Mixers were on active duty with the Engineers in France. And they did their work regularly day after day under all kinds of adverse conditions. They "stood the gaff".

Good proof that Lakewood "Built to Last" means just that. Get your mixer from Lakewood. It pays YOU.

Bulletin 21-A?—By return mail?

Offices in New York, Philadelphia, Washington, Pittsburgh, Detroit, Chicago, Milwaukee, Salt Lake City, Los Angeles, Seattle, Kansas City, Oklahoma City, San Francisco and Houston.

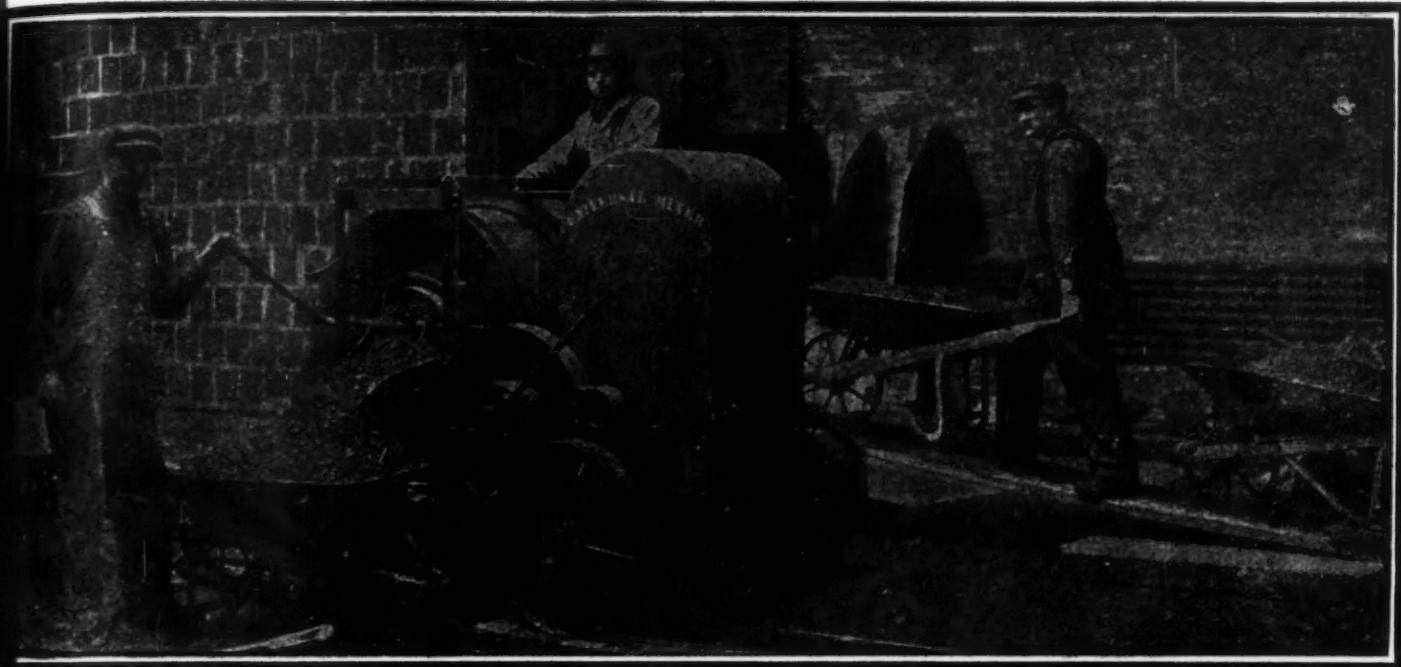


Lakewood Const.



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What Should Be Used On Every Job

Many contractors have found that Lakewood Universal Mixers on the job pay big dividends. For instance, the North Chester Realty Co. used 10 Lakewood Universals on building construction near Philadelphia.

The Casper Ranger Construction Company used six Lakewood Universals to mix concrete for the foundations for 300 houses at Quincy, Mass.

Wells Brothers used seven Lakewood Universals at Harrisburg, for government housing work.

These and hundreds of other instances where one, six, ten or more Lakewood Universals have been used on one job show that contractors thoroughly appreciate the value to them of using Lakewood Universal Mixers.

Want more facts?—Bulletin 21-A?

THE LAKEWOOD ENGINEERING COMPANY
CLEVELAND, U. S. A.

*The Lakewood Universal—
lighter in construction for
easy portability. Just the
machine where the mixer
must be moved quickly and
frequently. Seven cubic foot
size with charging platform.
Immediate delivery.*



Construction Plant

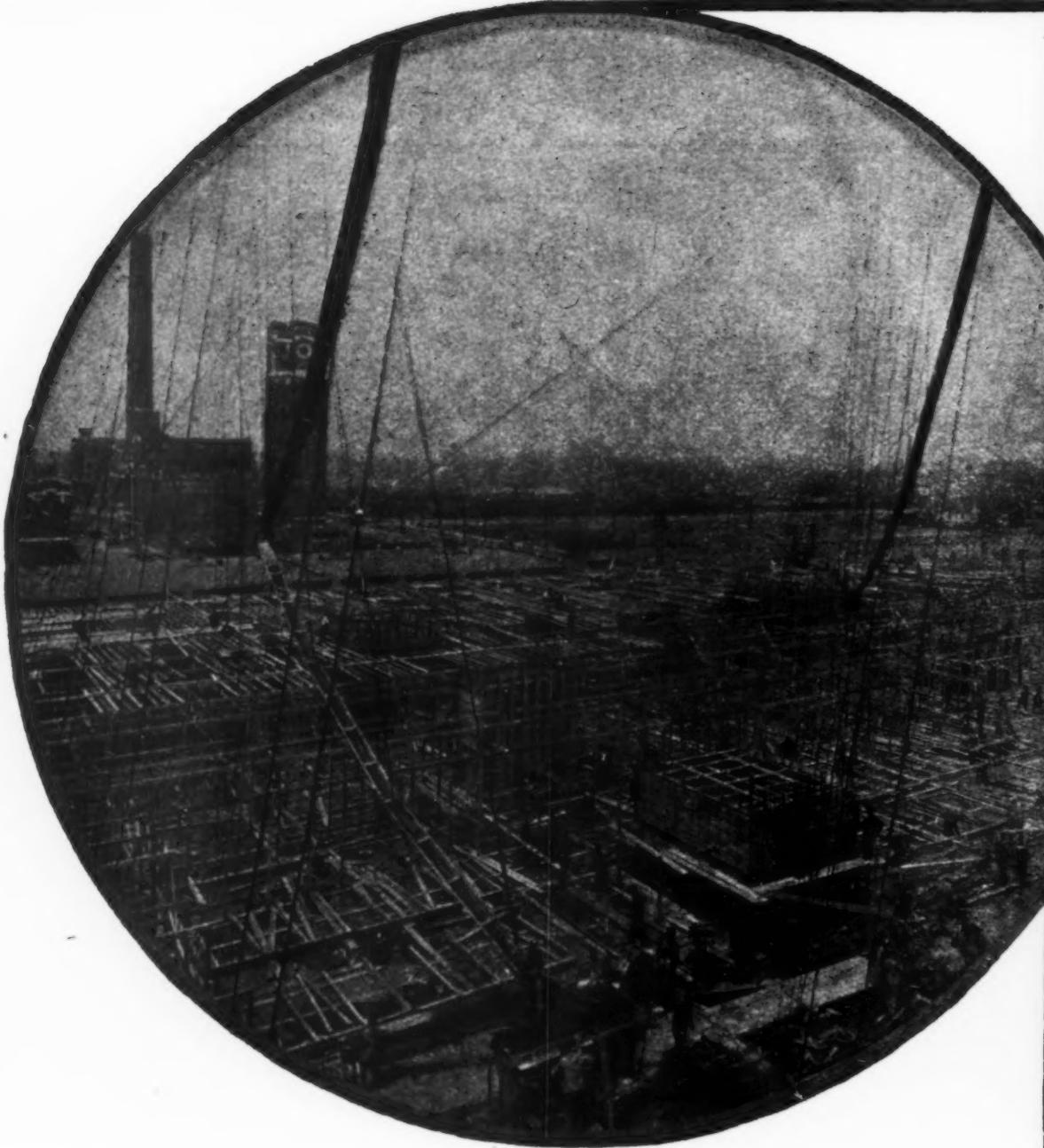
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Lakewood Plant Mixed and Placed Concrete

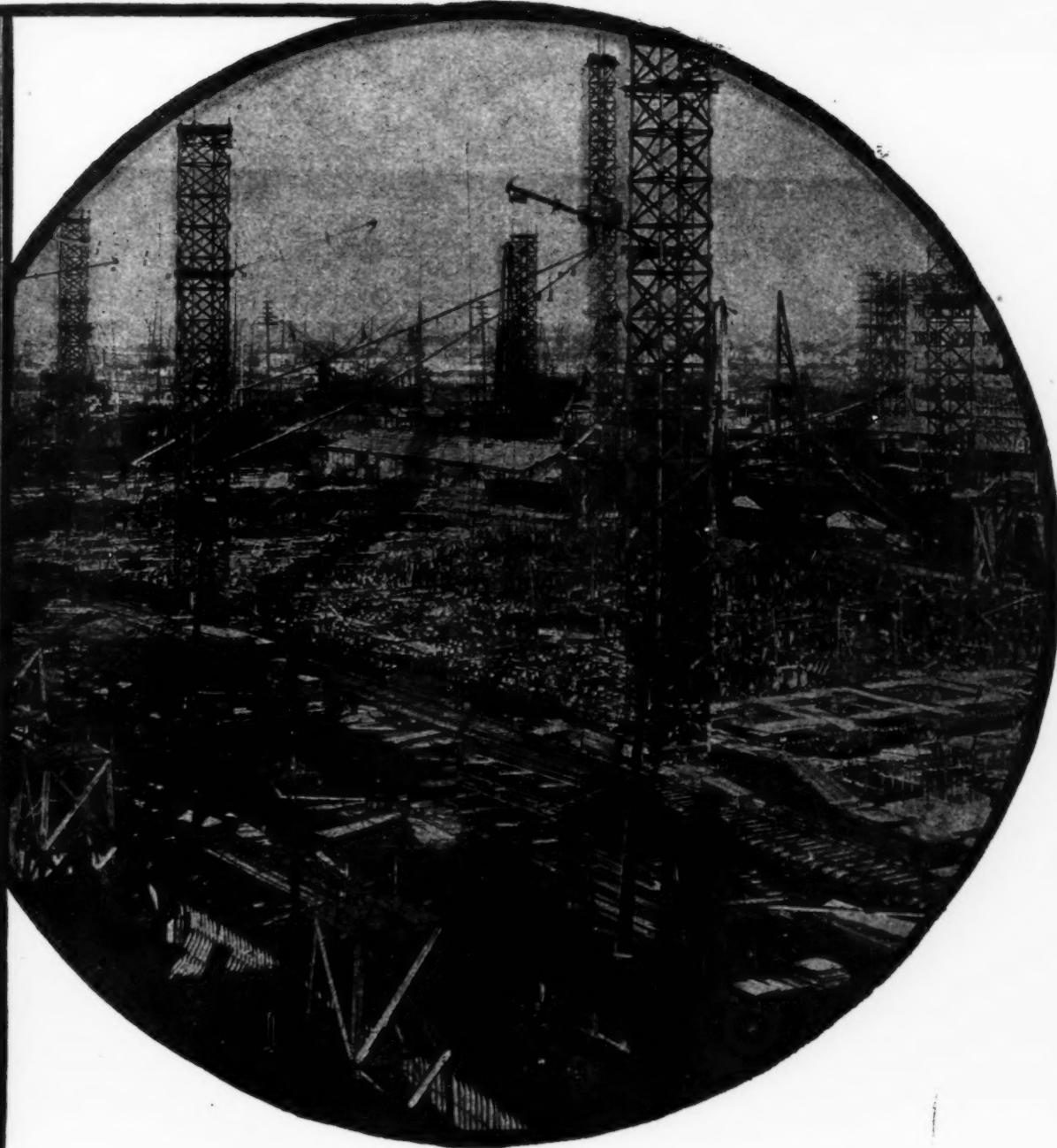
The \$3,000,000 Quartermaster's Depot

This building, containing 62,000 cu. yds. of concrete, was completed six weeks ahead of schedule by exact coordination of operations and high speed in placing concrete. The Lakewood equipment used by E. W. Sproul, Contractor, included mixers, towers, buckets, chute, floor hoppers, receiving hoppers, concrete carts and two way hopper switches.

Complete plant for big jobs and small ones—THE LAKWOOD CONCRETE PLANT—will give you the Lakewood Bulletins?



Lakewood Concrete



Quickly and Economically on These Jobs

The \$15,000,000 New Orleans Army Base

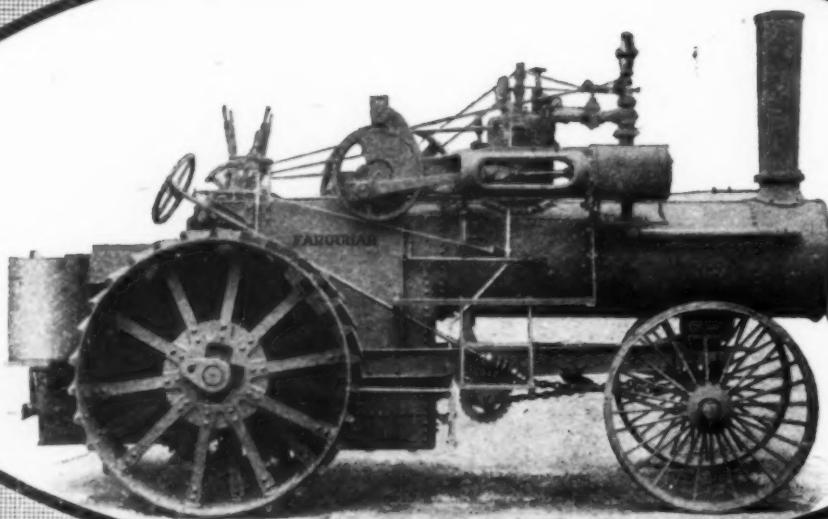
Four Lakewood concrete mixing and placing plants were used by the Geo. A. Fuller Co. on the construction of the New Orleans Army Supply Base. Each plant includes a 28-cu. ft. Lakewood mixer. In all, 12 Lakewood mixers were used, in addition to Lakewood chute, concrete carts, hoppers, clam shells, etc.

THE LAKWOOD ENGINEERING COMPANY
CLEVELAND, U. S. A.

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21 Columbus St., New York, U.S.A. Canada-Baltimore-Boston



Construction Plant



A Farquhar Engine For Contractors

This Style K Traction Engine is particularly suited to the heavy duty and all-around service demanded by contractors.

It is a single cylinder double geared engine with steel gears and it comes in three sizes—15, 20 and 25 H. P.

Put it to work where the job is hard; it is built to stand up and deliver power.

Use it for a thousand and one jobs—plowing, hauling, driving heavy machinery.

It's an all-around service engine. Burns crude oil if you wish.

Complete specifications and full details in our Steam and Gas Tractor Catalog, which also shows other engines of use to contractors.

Write for catalog today.

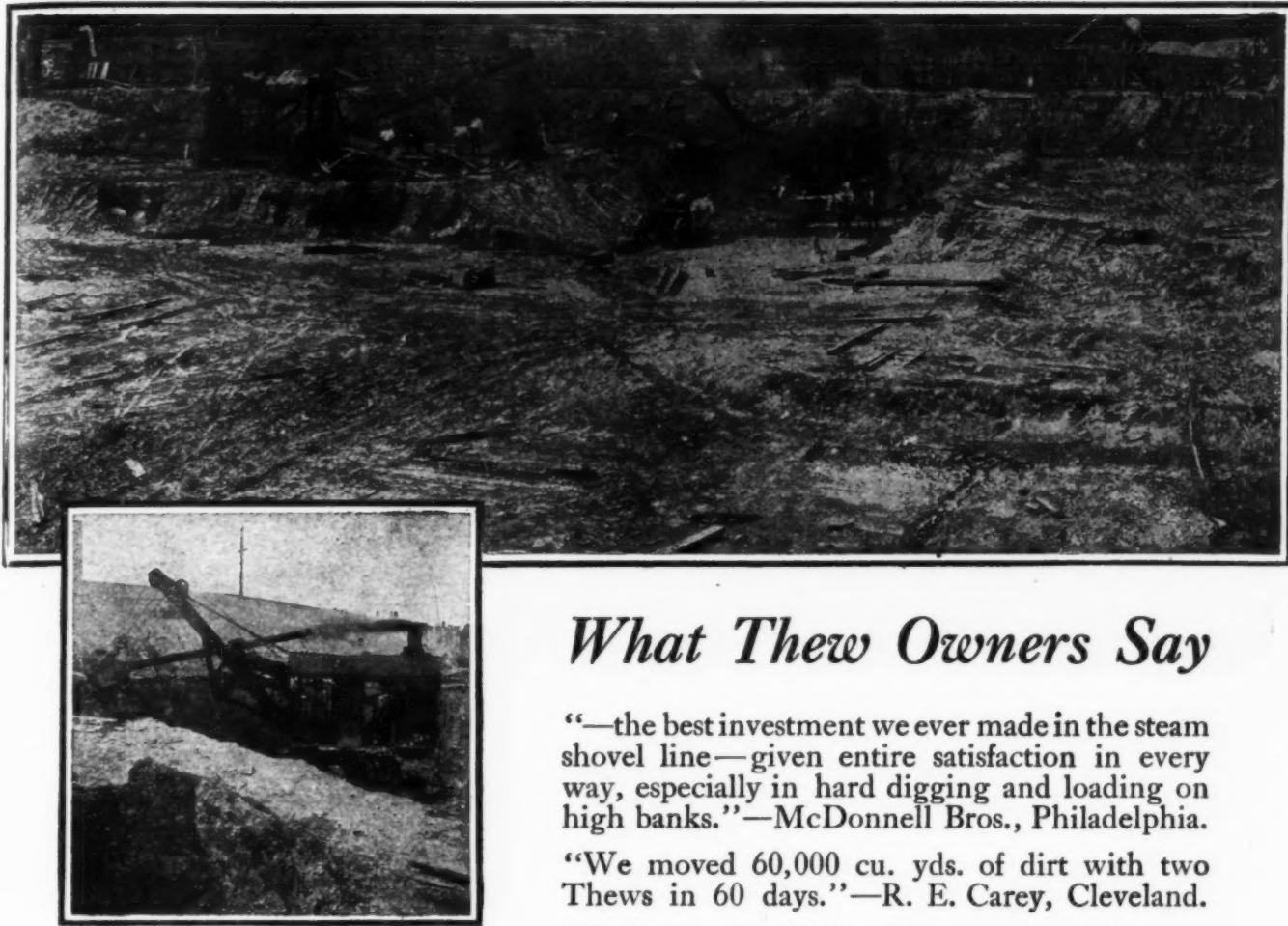
A. B. FARQUHAR CO., Ltd.



A. B. FARQUHAR CO., LIMITED

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ALLIED MACHINERY COMPANY OF AMERICA
31 CHAMBERS ST., NEW YORK, U.S.A. CHARLES ALMACOA NEW YORK

Thews are Everywhere



Thews Are Backed By 26 Years' Experience

Thews have served the construction industry for 26 years. Thew has always led in developing new features so that contractors would have a more efficient machine, capable of lowering digging costs. The good reputation of Thew Shovels, today, has been earned by an earnest effort on the part of the manufacturers to produce shovels that would earn the greatest profit for their users. The success of this 26 years of effort is evidenced by the great number of contractors who use Thews exclusively.



What Thew Owners Say

"—the best investment we ever made in the steam shovel line—given entire satisfaction in every way, especially in hard digging and loading on high banks."—McDonnell Bros., Philadelphia.

"We moved 60,000 cu. yds. of dirt with two Thews in 60 days."—R. E. Carey, Cleveland.

"Today we dug 244 ft. and refilled the 8-ft. ditch in 8 hours—18 cents a running foot."—Wm. C. Martin, La Salle, Ill.

"—120 lineal ft. of shale 9 ft. wide and 12 ft. deep, one day's results."—S. A. Haddad, Cleveland.

"Average 100 ft. a day, 5 ft. wide and 15 to 18 ft. deep in clay almost as hard as hardpan."—Jos. F. Stabell Co., Buffalo.

Contractors who use Thews are our strongest boosters. Ask any Thew owner.

THE THEW AUTOMATIC SHOVEL COMPANY
LORAIN, OHIO

New York: 30 Church Street

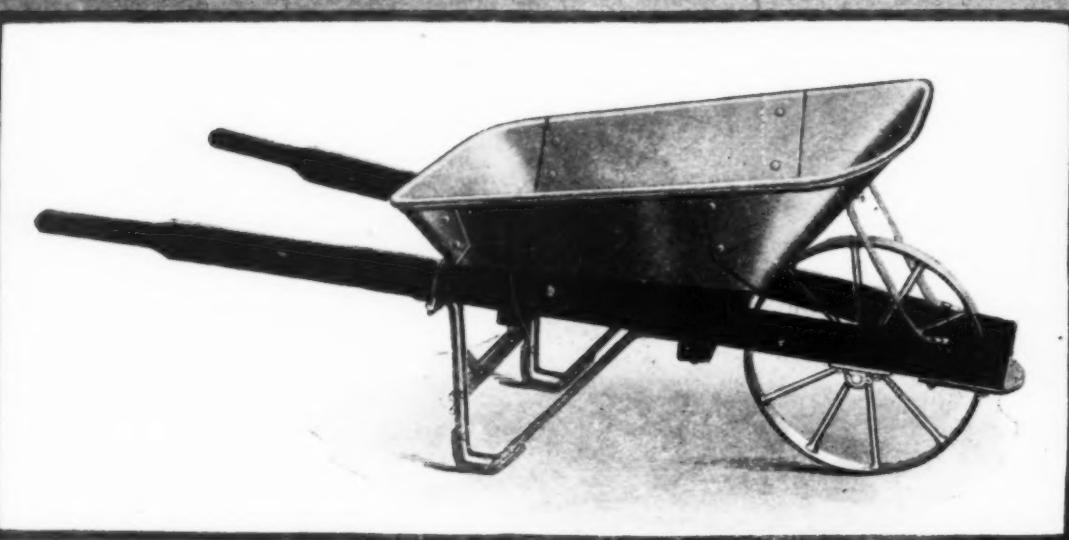
Chicago: Monadnock Block

THEW Power Shovels



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Four Cost Factors

Initial Cost

Of these four factors the initial cost is entitled to the least consideration. For the other three are your real costs—the factors which govern the profit on your investment.

Be a careful buyer—yes. Compare prices so you will know how wheelbarrows range in price—but don't let your comparison stop here. Look beyond the initial cost.

Study the other three factors for they are the ones that determine whether yours shall be a profit or loss on the purchase of your wheelbarrows.

The Cost of Assembling

Wheelbarrows come to you knocked down. What does it cost you to put them together, both in labor and in time?

The Sterling comes to you with wheel and axle in one unit. Another exclusive Sterling feature is that there is no right or left handle. The channel iron support and the center drilling of the holes provide ease in assembling.

Don't figure on saving on the initial cost—you are liable to spend more on the assembling cost.

Sterling



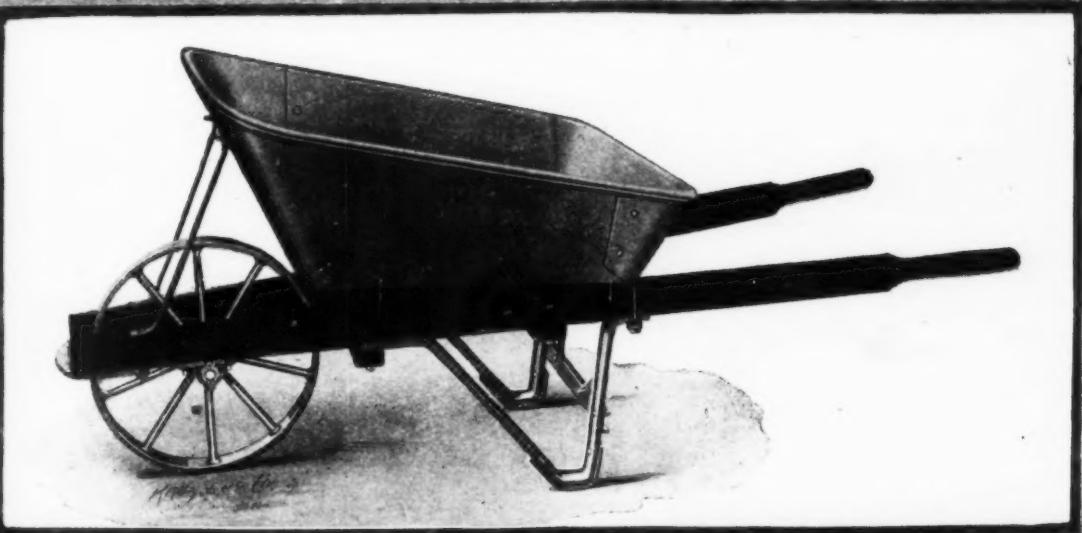
Consider All Factors

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STERLING WHEELBARROW

New York Chicago Detroit

Sterling On A Wheelbarrow Means



How Many Do You Figure?

Upkeep Cost

Consider the saving effected by Sterling standardization. No large assortment of repair parts to tie up capital and to depreciate. No matter how many types of wheelbarrows you use the spare part problem is simple—if you use Sterling.

Then these six big Sterling features mean added life and service:

1. The 10-spoke smooth tired wheel.
2. The cotter-pin instead of an axle bolt.
3. The riveted leg construction—no stove bolts used.
4. Broad flat leg construction.
5. The never splitting handles. They are clamped on, not bolted.
6. The self lubricating bearing.

Labor Cost

With the present price of labor here is the feature that you cannot ignore.

The ease of handling, due to the perfect balance and the freedom from bumps on the tire of the wheel, adds to the work you can get from your men every day. And these mean a deduction in labor costs on any job—a feature which demands your serious consideration.

We have given here a few of the reasons why Sterling Wheelbarrows keep down costs and speed up production.

If you are interested you will want the whole story. Write us for it today. We are ready for you to say: "Prove to me how Sterling Wheelbarrows are the cheapest and best I can buy." Make us show you how. Write today.

Sterling



And You'll Buy Sterling

COMPANY - Milwaukee, Wis.

Cleveland Boston

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More Than Sterling On Silver



Don't Worry Over Labor- Shortage—Get a B-G Conveyor!

SCARCITY of labor need not bother you—if you have a B-G Conveyor at hand for the moving of material.

This machine does so many loading and unloading jobs so well and so promptly that you can be independent of that bugbear—scarcity of labor.

And when help is not only high-priced but also hard to get and keep, you owe it to yourself to install all the labor-saving devices you can use. The

B-G Standardized Conveyor

is as vital to your needs as labor itself because it reduces labor in necessary work and gets it done better, quicker at less cost.

The B-G Conveyor handles cement, gravel, cinders, brick, stone, ashes—all kinds of bulk and package materials.

B-G Standardized Conveyors are Belt Conveyors—soundly built—portable type (12 feet to 60 feet) and stationary type (in any length)—equipped with electric drive; supplied with gasoline engine when required—operation costs low—working capacity up to 150 tons per hour.

Our Service Department will be glad to select a B-G Conveyor suitable to your needs. Write for new catalog describing many unusual installations.

BARBER-GREENE COMPANY

585 West Park Avenue, Aurora, Illinois, U. S. A.

Branch Service and Sales Offices:

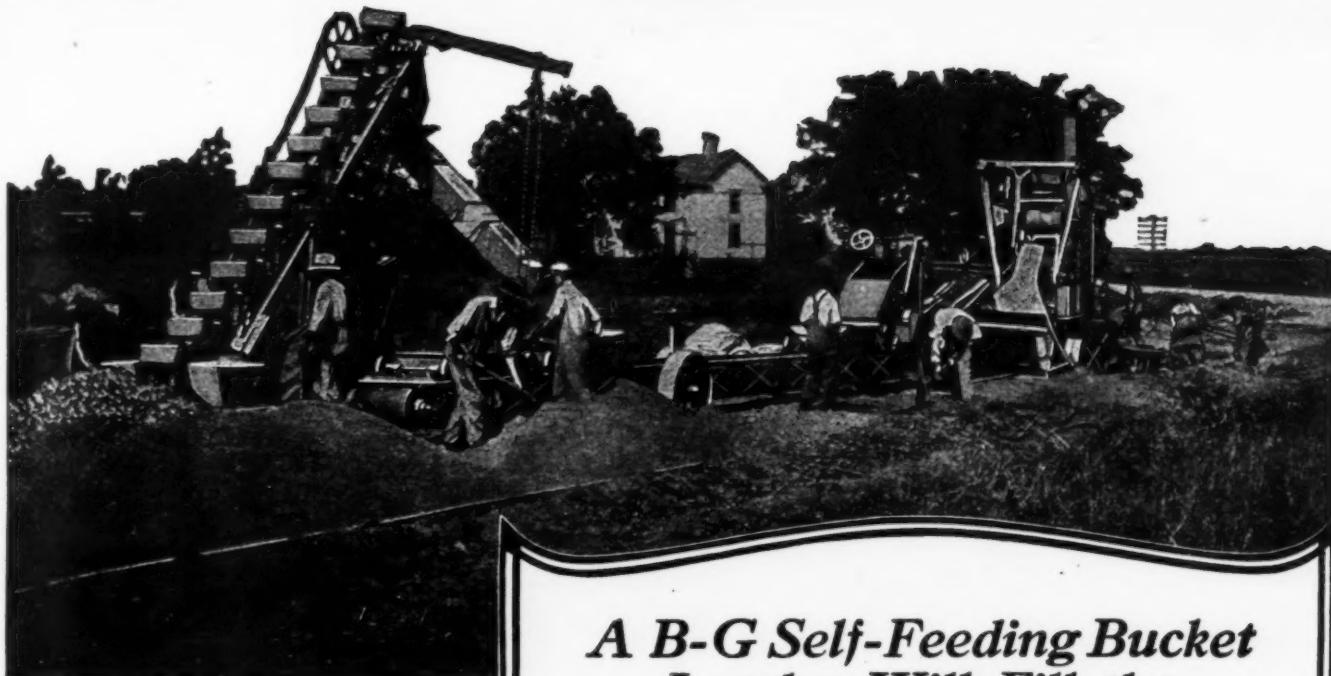
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The above photograph shows a Style A, B-G Self-Feeding Bucket Loader at work on Jefferson Highway near Minneapolis. The entire job from loader to mixer is being done mechanically.

As to the work the B-G Loader is doing here the foreman stated emphatically that he "would rather lose any other piece of equipment on the job than the B-G Loader."

A B-G Self-Feeding Bucket Loader Will Fill the Labor-Breach!

IF you have trouble getting enough men to handle your material, the installation of a B-G Self-Feeding Bucket Loader will easily eliminate your difficulty.

This machine does the work of many men and more than amply fills the breach when labor is scarce and hard to get. It does all you can ask of any machine of this kind.

Contractors everywhere who know how to get big results quickly are using the

B-G Self-Feeding Bucket Loader

In many instances B-G Loaders operated by one man are replacing a dozen men with shovels.

The Patented Bucket-Feeding Device is a distinctive B-G feature. It consists of two horizontal steel discs (set close to the ground) which cut under the piles of material and, revolving inward toward the buckets, convey the material to them.

Where you have to handle sand, gravel, stone, coal, coke and other similar products you can't beat the performance of the B-G Loader. Consequently unless you know all about the B-G Loader you are missing big opportunities on every loading job.

Write for complete information.

BARBER-GREENE COMPANY

585 West Park Avenue, Aurora, Illinois, U.S.A.

Southern Branch: BIRMINGHAM, ALABAMA

Branch Service and Sales Offices:

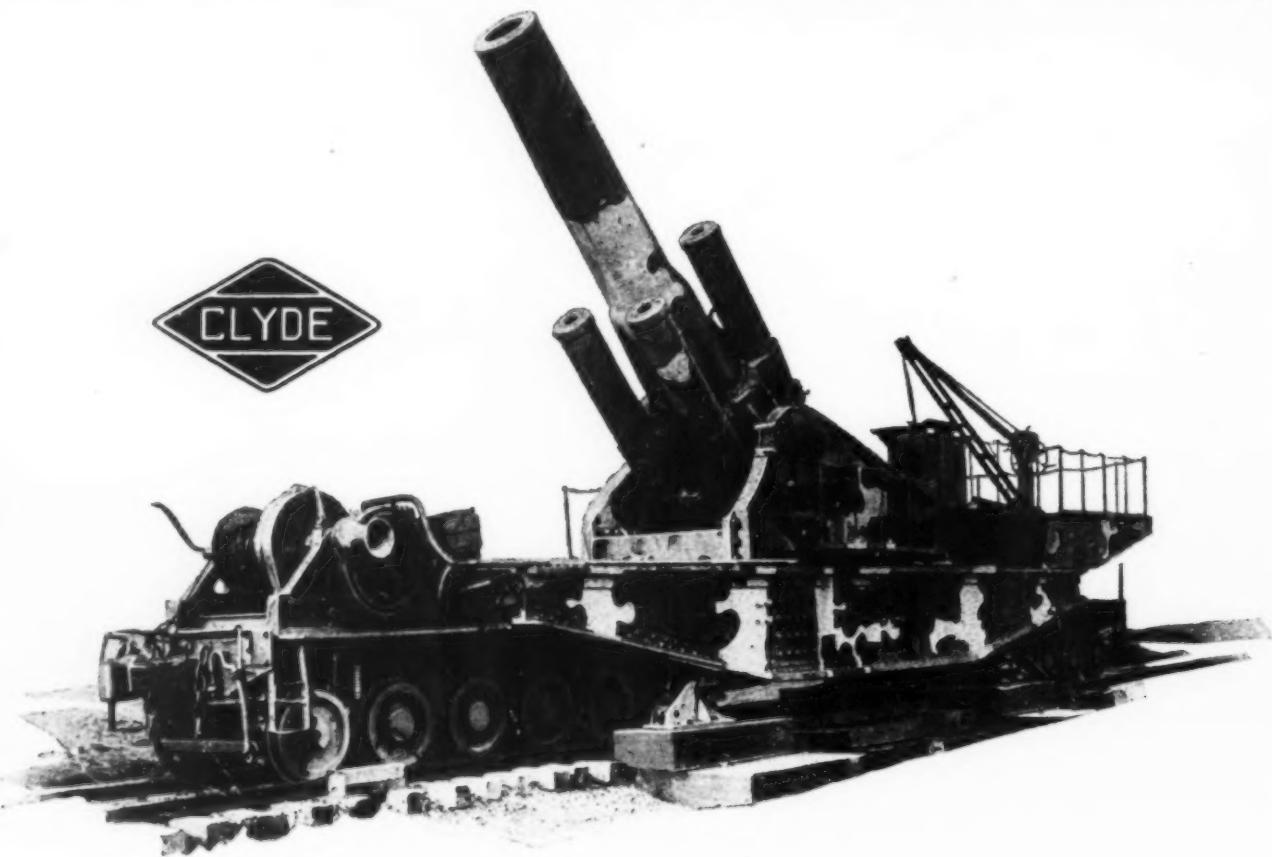
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This Gun—This Car—A Tremendous Weight Moved by Clyde Gasoline Hoist

And the hoists do more than that! Mounted right on the car, they withstand the tremendous vibration and concussion which come with every firing—a shock which would shake a frail trailer hoist to pieces almost instantly. Here's what happened when these big guns were fired in France: The recoil each time drove the car—gun, hoist and all—back along the track. And the Clyde Gasoline Hoist—mind you—moved the gun back to its original firing position.

**Made Good For Uncle Sam
They'll do the Same for You**

Every hoist user wants to know just what these hoists are and what they can do—how they're built and their record of performance. To answer all these questions and the others that you are naturally interested in, we've issued a special Bulletin on Clyde Grade Gasoline Hoists.

It's our Bulletin "P". Get your copy at once—send now while you're thinking of it!

An Easily Handled Portable Hoist

Reliable, too. No question of the convenience, economy, satisfaction. No hauling fuel or water. No trouble—no costly delays. The ideal hoist—proved good in service. If you use hoists or need one—get our bulletin "P" now. It's well worth your while.

CLYDE IRON WORKS, Duluth, Minnesota

Manufacturers of Steam, Electric, Gasoline and Belt Hoists, Derricks, Excavators, Blocks and Sheaves, Etc.

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Clyde—Grade Gasoline Hoists



THREE WAGONS A MINUTE



ONE man with a Western Machine Outfit loaded 165 Dump Wagons in one hour. The amount of work which the Western Elevating Grader and Wagon Loader can accomplish is limited only by the speed of your motive power and efficiency of your foreman.

No tractor was ever built that could work a Western Elevating Grader to the limit; a thousand or more cubic yards a day can be moved easily, using team or tractor power.

The cheapest known method of moving dirt, under right conditions, is by Western Elevating Grader. Western Dump Wagons are practically standard, combining lightness with strength.

Does your contract require a machine-outfit? It will put money in your pocket to buy a Western. Parts carried in local warehouses, conveniently placed.

Send for Illustrated Catalog

WESTERN WHEELED SCRAPER COMPANY
Earth and Stone Moving Machinery
Aurora, Illinois, U. S. A.
Founded 1877





Western Dump Cars

Observe the lift of that eight-yard dipper in Niagara Falls Power Development.

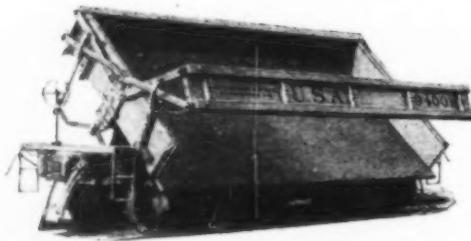
It takes a real dump car to stand up under that 12-ton impact.

Look at that 40-foot trestle-dump on the same job.

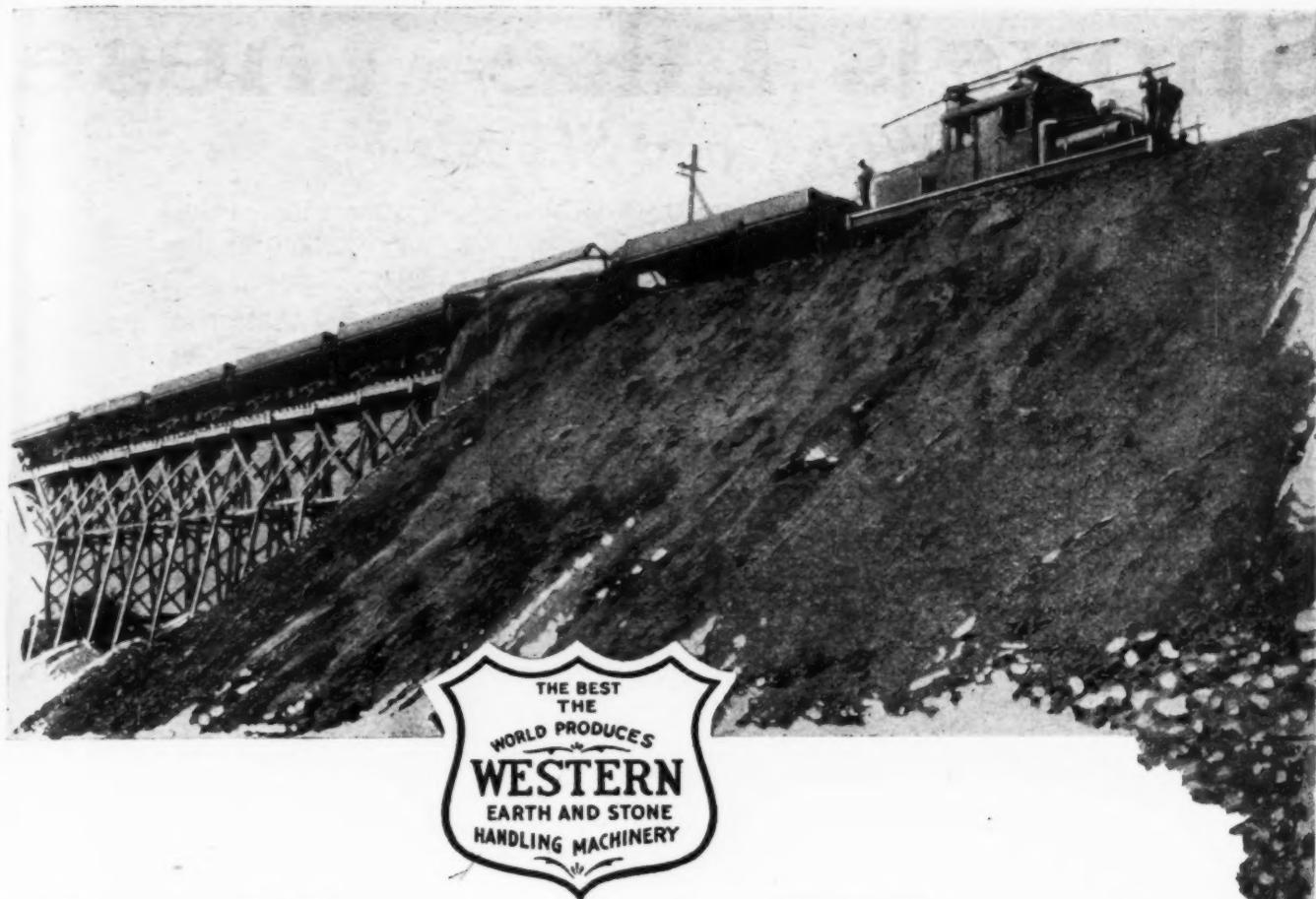
Western all-steel Automatic Compression Lock 20-yard air dump cars—150 of them—were selected for this heavy work, and there have never been more than five in the repair shop at one time—5 out of 150, a remarkable record.

Loaded with stone, they have been hauled miles in regular Grand Trunk freight trains—that tells the story.

Our Engineering Department is at your service.



Western Wheeled
Aurora,



In Heavy Work

These Western cars will *outwork* and *outlast* any other make of dump car on the market.

With the same amount of air they have 34 per cent greater dumping power and more dumping speed.

Designed for heavy work. Vertical cylinders—no side chains.

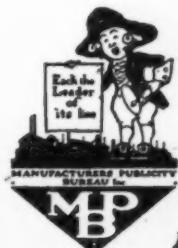
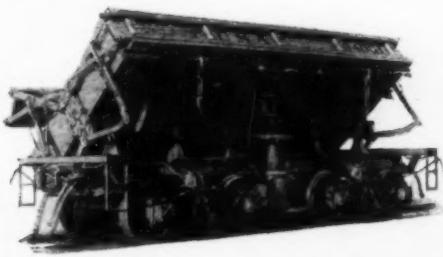
Standard Western design, giving steep dumping angle and large discharge opening. Shock of the load carried directly through the truck springs to the road bed.

Made in four sizes: 12, 16, 20, and 30 cubic yards.

Write for illustrated description.

Scrapers Company

Ill., U. S. A.



Shovels Like These

With Good Shovels

Good hand shovels have come rapidly to the fore as labor wage scales mount skyward. And rightly so. They present the one solution to the grave problem of employing shovelers at a profit.

It's no longer a question of the initial cost—no longer a routine matter to select hand shovels. The **only consideration now** is how much dirt can the average man move with his shovel per day. Right there lies the determining factor.

With this condition, it's natural that considerable thought is given the purchase of shovels. And in considering all shovels these facts are made clearly evident:

The Wyoming Shovel Works

NEW YORK, 165 Broadway

CHICAGO, 347 Peoples Gas Building

BOSTON, 118 Pearl Street



31 Chambers St., New York, U.S.A. Cable ALMACO New York

*The Red Edge
Shovel*

*Marked for
your protection*

